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What shapes the generosity of short- and long-term benefits?

A political economy approach

Baptiste Françon[1] and Michaël Zemmour[2]

Abstract : Degressivity of unemployment benefits is a major feature of social protection in most industrialised countries: the replacement rate (the ratio between the level of welfare benefits and the previous income) typically declines with the length of the unemployment spell. Moreover degressivity of unemployment benefits has significant distributive effects as the risk of long-term unemployment varies from one individual to another. This paper proposes a formal model of political support for unemployment insurance that takes into account the decrease in the level of benefits over time. A discount factor is introduced that diminishes the level of benefits for long-term unemployed. The main predictions of our model are the following: i) Unemployment insurance size negatively depends on both the average level and the heterogeneity of unemployment risk ii) The degressivity increases with the average level and the heterogeneity in the individual level of employability defined as the probability of finding a job when unemployed. These predictions are then tested using a dataset of 24 OECD countries. Empirical results are consistent with the model.

Economie politique de l'assurance chômage : quels déterminants de la générosité des prestations de courte et de longue durée ?

Résumé : Le caractère dégressif de l'assurance chômage est un trait commun de nombreux pays industrialisés: le taux de remplacement décline au cours de la période de chômage. De plus, le degré de dégressivité a des conséquences distributives importantes dans la mesure où le risque de chômage de longue durée n'est pas uniforme. Cet article propose un modèle d'économie politique dans lequel la demande d'assurance chômage prend en compte la distinction entre chômage de courte et de longue durée et la possibilité de prestations dégressives. Les principales prédictions du modèle sont les suivantes : i) le taux de remplacement moyen des prestations chômage dépend négativement du chômage moyen et de l'hétérogénéité du risque de chômage dans la population. ii) La dégressivité des prestations est d'autant plus forte que l'employabilité moyenne est plus faible et que le niveau d'employabilité des salariés est hétérogène. Ces prédictions sont testées sur des données OCDE concernant 24 pays. Les résultats obtenus sont cohérents avec le modèle.

Keywords: long-term unemployment, political economy, replacement rate, risk heterogeneity, unemployment insurance, voting behaviour.

Mot-clés: assurance chômage, chômage de longue durée, comportement de vote, économie politique, hétérogénéité du risque, taux de remplacement.

JEL : D72, J65, P16

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1. Introduction

Scholars who address the political determinants and the economic effects of social insurance in a comparative perspective generally focus on its overall generosity, measured in terms of total expenditures or of replacement rates. However, an equivalent amount of social insurance does not necessarily imply the same repartition of benefits among welfare recipients, as the rules according to which benefits are calculated may vary from one country to another. For instance, social insurance regimes differ in their definition of eligibility requirements in terms of past contributions, or in the reference that is used to compute the level of benefits (last paid wage or wage averaged on a broader period). Since the definition of these parameters entails significant distributive effects, one should expect the social insurance design to be a source of political conflict among citizens, which cannot be mistaken for a pure “technical” issue. Moreover, the alignment of workers' interest toward these parameters might differ from the one relative to the size of social insurance.

In this paper, we are interested in the political preferences for unemployment benefits degressivity, where degressivity measures the extent to which the level of benefits decreases with the length of the unemployment spell. As such, degressivity is a prominent and conflicting feature of the unemployment insurance (UI) design: while it determines the share of benefits dedicated to short- and long-term unemployed respectively, the rate at which the level of benefits declines over the unemployment spell varies a lot across countries and welfare regimes, and long-term benefits amount to a significant share of total UI expenditures in some countries. Moreover, we argue that the political economy of degressivity has a different, and partly autonomous, logic from the one that governs the determination of the overall degree of UI generosity.

The importance of analysing UI degressivity as an independent object is justified by the recent trend of reforms in industrialised countries. Those reforms were characterised by the revision of the calculation rule for unemployment benefits rather than full liberalisation, a pattern particularly salient in continental Europe since the 1990s (Clegg, 2007). Typically, they have consisted in cutting or shortening long-term unemployment benefits, while compensation for short-term unemployed was broadly maintained at the same level. In practice, revision of the calculation rule for benefits took the form of a gradual decline in their level with the duration of the unemployment spell (e.g. France 1979 and 1992, Sweden 2008) or, more drastically, a reduction in the duration of compensation (Germany 2005, Denmark 2006).

In summary, while this path of reforms implied a fall in the overall generosity of UI schemes in many countries, the impact on degressivity was far more pronounced.[3] Labour economists who investigate the effects of benefits duration (Meyer, 1990; Hunt, 1995) or gradual decline in compensation (Van der Berg, 1990) on the exit rate from unemployment generally put forward the disincentive effects associated with generous long-term benefits. From this point of view, the recent wave of reforms could be analysed as a trend toward an efficient UI design. However, this type of explanation is not satisfying, as it does not account for why long-term arrangements for unemployed emerged in the first place. The political economy approach endorsed in this paper emphasises the role of political support - at the country level - in determining on one hand the level of UI generosity and on the other hand the level of degressivity. In this framework, this type of parametric reform was carried out because it was politically less costly to implement than across-the-board cuts, suggesting that the interests at stake were not the same.

In most OECD countries the public scheme for UI is mandatory, or equivalently has a very high level of coverage. Among social protection schemes, UI is probably the closest to the ideal type of a “Bismarckian” social insurance. Indeed, it is funded through social contributions proportional to wages and distributes benefits related to previous earnings. Its main purpose thus serves to socialise risks, maintaining the income level in case of job losses. While UI has therefore a relatively weak impact on redistribution across different classes of incomes, there is still redistribution taking place from people with a low unemployment risk toward those more exposed (Wright, 1986; Sinn, 1995). This implies that the unemployment risk is a prominent determinant of individuals’ preferences for UI generosity. Hence, recent contributions from the political economy literature have highlighted the impact of risk distribution on the size of social protection (Iversen and Soskice, 2001; Kim, 2007; Rehm, 2011).

Drawing on this literature, the originality of this paper is to propose a simple model where compensation is no longer uniform over time. Our main argument is that the degressivity of benefits is a core parameter of the UI and that it may have major political and distributional

[3] Note that we adopt a broad definition for degressivity that also includes reduction in compensation duration. In our model, this corresponds to the extreme case where benefits are set to zero for long-term unemployed.

effects. This model distinguishes between two stages of unemployment, short and long-term, and accordingly two levels of benefits. Agents vote over the global envelop of resources dedicated to unemployment compensation and also over a degressivity parameter that settles how benefits will decline with the length of the unemployment spell. While the existing literature generally acknowledges that unemployment risk combines the risk of job loss and the risk of staying unemployed[4] (i.e. lack of employability), this distinction does not play a role in the determination of the political equilibrium. On the contrary, we claim that job loss risk and employability will affect differently the UI design since these two features are not distributed similarly among workers. The main predictions of our model are the following: i) UI size negatively depends on both the average level and the heterogeneity of unemployment risk ii) The degressivity increases with the average level and the heterogeneity in the individual level of employability.

This paper is organised as follows. Next section displays descriptive statistics on UI degressive design in OECD countries. Third section provides a brief review of the literature dealing with the political economy of social protection. Section 4 details the model and its main predictions. Section 5 presents some empirical evidence in line with the theoretical results. Last section concludes.

2. Descriptive statistics

In this section, we present descriptive statistics about short- and long-term unemployment benefits[5] and the characteristics of unemployment by country.[6]

Figure 1.1 depicts the relationship between the average replacement rates of short- and long-term benefits, where long-term is defined as spells of unemployment longer than a year. Countries in blue have earnings-related benefits (Bismarckian), while for countries in red UI the benefits are flat rate (Beveridgean).[7]

[4] A possible third dimension would be the risk of getting a worse-paid job, but this is out of our scope.

[5] It is worth noticing that we are here talking about the unemployment insurance system, excluding all types of minimal income and other solidarity benefits designed to fight poverty.

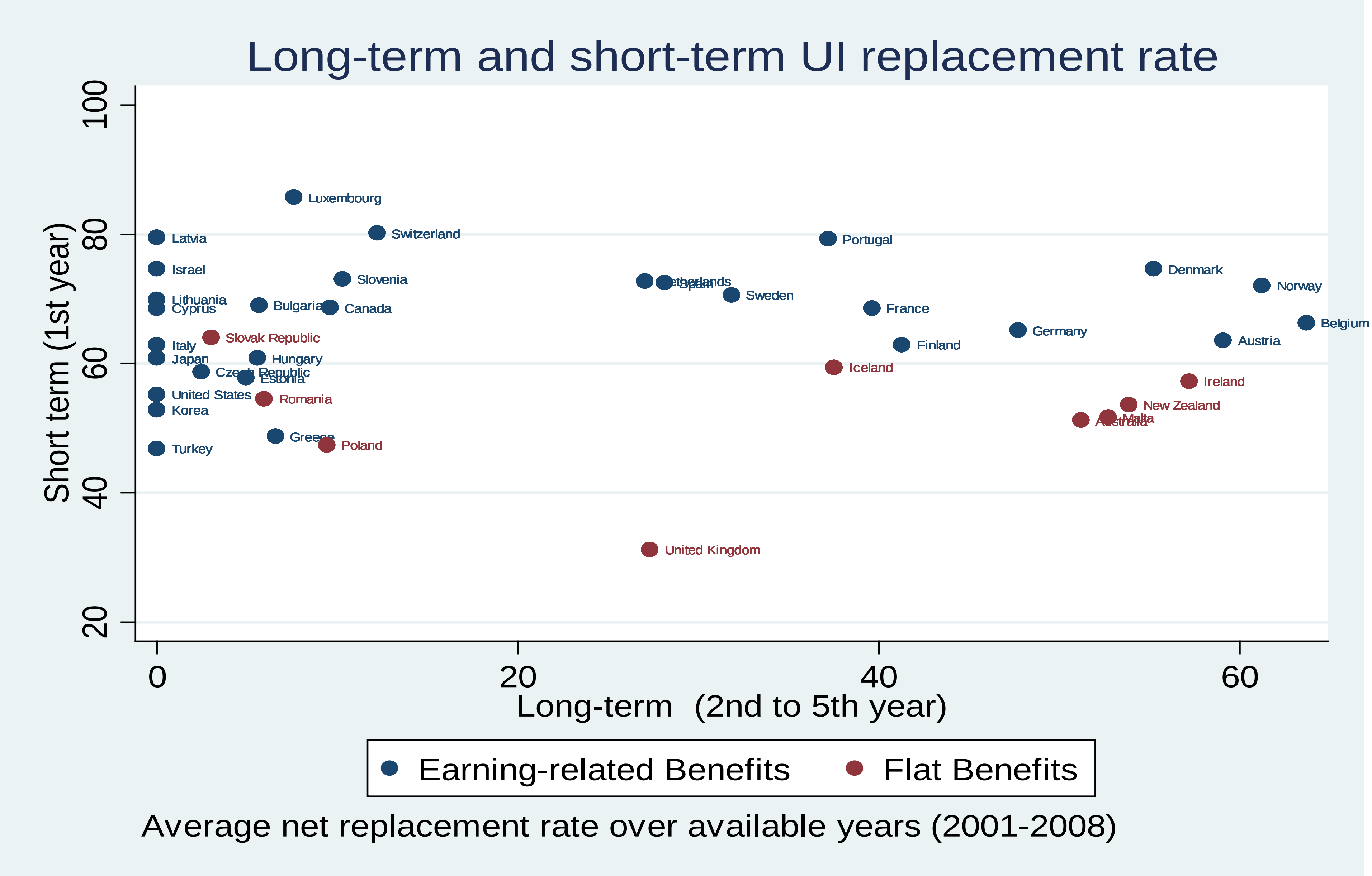
[6] Details about indicators can be found in Appendix 1.1.

[7] Countries may deliver flat rate benefits of different amount for short- and long-term unemployed.

As stated above, a large majority of countries have a Bismarckian type UI.[8] Short-term replacement rates range from 31% (UK, where UI benefits are not earnings-related) to 85% (Luxembourg), with a mean around 63%. Long-term replacement rates range from 0% (Cyprus, Israel, Italy, Korea, Turkey provide no UI benefits after one year of unemployment)[9] to 63% (Belgium) for an average value of 22.5%. Figure 1.1 does not reveal any clear pattern in the relationship between short- and long-term benefits. The distinction between Bismarckian and Beveridgean types of UI is not very conclusive either. Finally, we observe that the variability across countries is more important for long- than for short-term benefits.

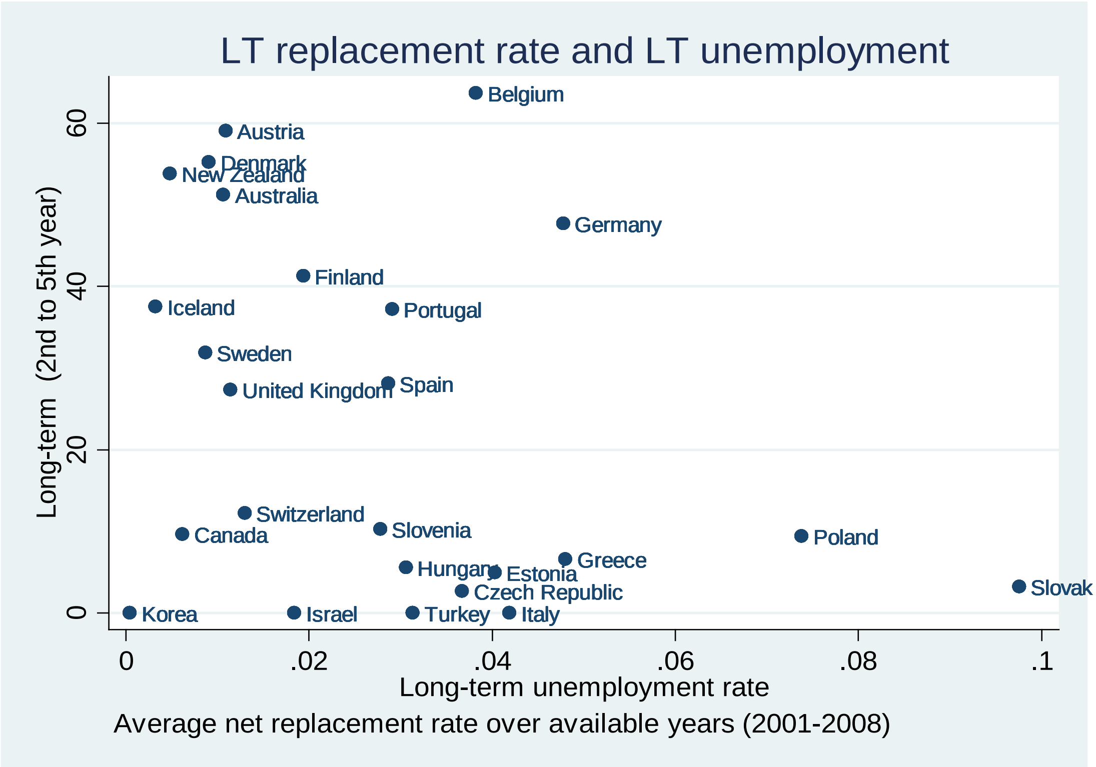
[8] This distinction is based on the OECD country documentation, “Work incentives” series.
[9] Entitlement to benefits even stops earlier (after a few months) for some of these countries.

Figure 1.1: Long-term and short-term UI replacement rate



The existence of disincentive effects would suggest that the level of long-term unemployment is driven by the level of long-term benefits. In Figure 1.2, we compare the long-term generosity of UI with the absolute level of long-term unemployment.

Figure 1.2: Long-term replacement rate and long-term unemployment

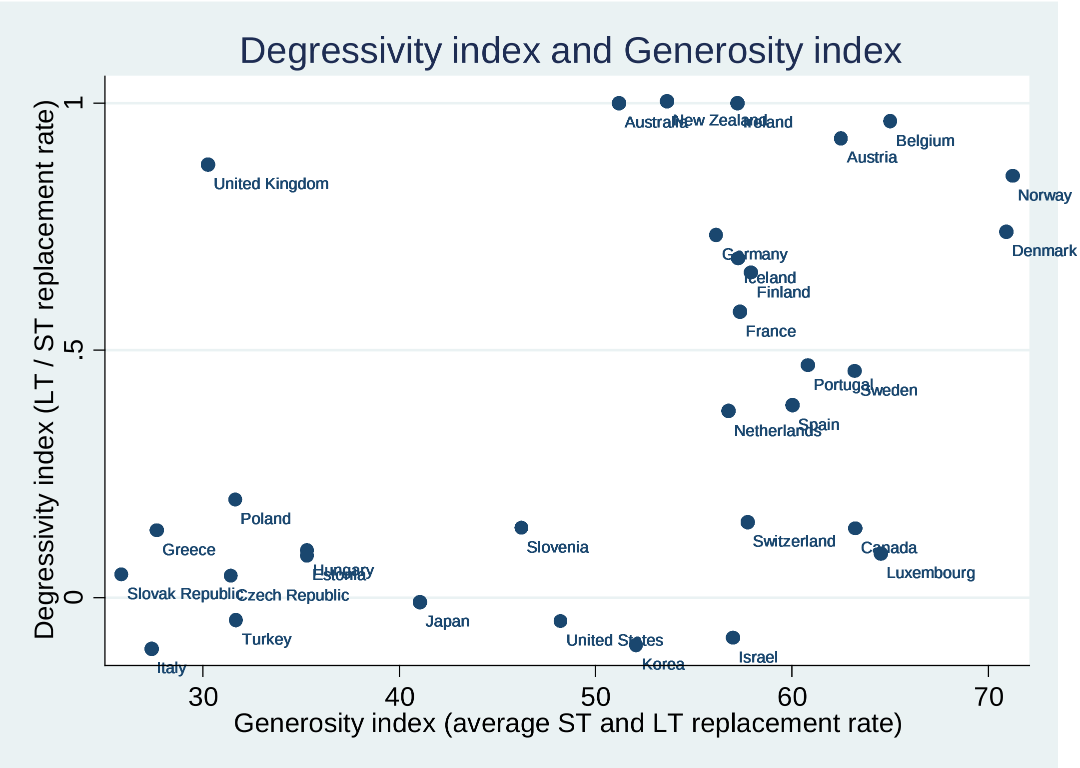


There is no clear pattern emerging from this figure. If anything, higher long-term unemployment is generally associated with smaller long-term benefits. This implies that higher long-term benefits do not have strong disincentive effects. It rather suggests that high rates of long-term unemployment enhance the political and budgetary pressure to reduce long-term benefits generosity, a feature that our model accounts for. Let us now come to the two dependent variables examined in this paper to capture the bi-dimensional characteristics of UI: the overall generosity of the system (defined as the weighted average of short- and long-term replacement rates) and the degressivity (defined as the ratio of long-term replacement rate over short-term replacement rate)[10]. The distribution of these variables across countries is displayed in Figure 1.3. At first sight, one sees that there is strong variability in both dimensions, while again there is no clear relation between them. The ranking of countries according to our *overall generosity index* is in line with usual typology from the welfare state literature. Besides, the degressivity index especially exhibits strong variability among

[10] The construction of these variables is detailed in section 5 and in Appendix 1.1.

countries with a medium to high level of generosity. On the contrary, countries with a low level of generosity generally have a very degressive UI, UK being an exception. In this paper, our purpose is to determine what political economy determinants shape these two dimensions.

Figure 1.3: Degressivity index and overall generosity index



Note: The overall generosity index expresses the average replacement rate. Degressivity index takes value 1 for a non-degressive system and 0 if there is no long-term benefit at all. Value below 0 indicates that UI benefits stop before the end of the first year of unemployment.

Eventually, two additional remarks can be made. First, countries with very similar unemployment characteristics (average unemployment and share of long term unemployment) may have very different degressivity indexes. This is for instance the case of Denmark and Sweden or of Germany and Belgium (Table 1.1). Second, a quick estimation of the cost of long-term benefits reveals that the level of degressivity adopted by a country may have a strong financial impact, even in countries where the share of long-term unemployment is relatively small: for instance Denmark spends 15% of its UI expenditure to compensate long-term unemployed, whereas Sweden only spends 8%; Germany also dedicates less resources for long-term unemployment compensation than Belgium (43% against 48%), while having a slightly larger share of long-term unemployment. These figures make obvious that the relative generosity of long term benefit can be a major political issue (beside incentives or value judgments concerns): a significant social transfer is at stake, not only between employed and unemployed workers, but also between unemployed depending on their expected duration of unemployment.

Table 1.1 : Share of LT benefits in total UI expenditures (our estimation)

	Total unemployment rate	Share of long term unemployment in total unemployment	Degressivity index	**Share of LT benefits in total UI expenditures (rough estimation[11])**
Denmark	4.6	18.7	73.9	**15%**
Sweden	5.3	16.8	45.7	**8%**
Germany	9.1	51.1	73.3	**43%**
Belgium	7.7	48.9	96.3	**48%**

Source: our estimation, based on OECD data, see appendix 1.1 for details on variables

3. Literature

There is a large political economy literature exploring the determinants of political support for economic policies (Meltzer and Richard, 1981, Persson and Tabellini, 2000, Saint-Paul, 2000). Building on this literature, we endorse the view under which the size and scope of public UI reflect (at least at some point) the political preferences of citizens. Such an assumption is realistic in democratic countries, even if citizens do not directly vote on these particular issues. Indeed, political actors (political parties, unions…) who shape UI have strong incentives to take into account the preferences of their constituencies if they want to stay in power. Furthermore, we share with the political economy literature the assumption under which individuals' political behaviour (e.g. voting) is fundamentally motivated by their self-interest, i.e. the gains or losses they expect from a particular economic policy. Heterogeneity of political preferences then arises from differences in people's socio-economic position. In this view our paper departs from a social planner's perspective. We are interested in political decisions that are actually taken and not in the ones that would maximise macro-economic outcomes[12].

[11] We use the following formula:

$$Share\ of\ LT\ benefits\ in\ UI = \frac{LT\ Benefit * Shareof\ LT\ Unemployment}{ST\ Benefit * Share\ of\ ST\ Unemployment + LT\ Benefit * Share\ of\ LT\ Unemployment}$$

[12] A number of papers have explicitly dealt with the impact of UI generosity on the unemployment rate. Theoretically, one could expect unemployment benefits to create incentives distortions and to increase unemployment (e.g. Salanié, 2011, pp. 44-45). On the other hand, generous UI could enhance the efficiency of the matching process and thus foster employment stability (Acemoglu, 2001; Marimon and Zilibotti, 1999).

The seminal contribution by Meltzer and Richard (1981) addresses the determinants of preferences for redistribution policies. In this framework, redistribution takes place through the form of a lump-sum transfer paid to all agents, while this transfer is financed through a tax proportional to earnings. Some agents may choose not to work because of disincentive effects induced by redistribution. An important implication of the model is that only individuals with below-average productivity will support redistribution, as their gain from the transfer outweighs the cost of the taxes they pay; a realistic right-skewed income distribution then implies that the decisive median voter should have below-average productivity and then support some redistribution.

Subsequent contributions have introduced a useful distinction between vertical and horizontal redistribution (Wright, 1986, Sinn, 1995). Indeed, significant amounts of social transfers are in fact devoted to public provisions against risks of income losses (illness, unemployment or pensions). Social protection thus acts as a risk-pooling device that performs horizontal redistribution from low-risk workers towards high-risk workers, rather than vertical redistribution from low-income agents towards high-income agents. Looking at the preferences for UI, Wright (1986) proposes a model where unemployment is no longer the result of tax disincentives but of exogenous employment opportunities. Individuals are heterogeneous in this respect only (they earn the same wage when employed); their average time spent in unemployment is defined to be a function of the probability of losing their job and of the probability of finding a new one. Wright's model predicts that public UI can arise through majority rule even in the presence of complete private markets[13].

An important prediction of the Meltzer and Richard model states that total welfare payments would grow with income inequality, measured by the ratio between the productivity of the decisive median voter and the average productivity. Empirically, the evidence for this prediction is weak. Instead, one would rather observe the inverse relation in industrialised countries (Bénabou, 2000; Iversen and Soskice, 2001). An important strand of the literature has been dedicated to unravel this paradox. Building on Wright's paper, Moene and Wallerstein (2001) propose a model where agents not only differ in their (exogenous) unemployment risk but also in their income. A critical prediction of their model is that individuals with above-average income might support public welfare expenditures when they

Empirical evidence of detrimental effects of unemployment benefits on employment at the macroeconomic level remains controversial (Bassanini and Duval, 2009; Baccaro and Rei, 2007).

[13] Depending on the real interest rate.

are risk averse, as their insurance motive dominates their redistribution motive. As a consequence, they show that a decrease in the income of the median voter leads him to demand less welfare expenditures, and that income inequality might therefore lead to less redistribution. In a different framework, Iversen and Soskice (2001) make the point that risk aversion might differ across workers according to their skills. In particular, workers with specific skills (as opposed to general skills) will seek to protect their assets in the event of job loss, as their skills are not easily transferable from one job to another. This will lead them to have high preferences for generous welfare benefits. As there are less income inequalities in countries where the share of workers with specific skills is larger, these countries also have larger welfare expenditures. Hassler *et al.* (2002) make a similar argument to explain the unemployment rate and unemployment insurance levels in Europe and in the US.

Recent contributions in political science have provided empirical evidence of the relationship between benefits generosity and risk heterogeneity. Rehm (2011) shows that high occupational unemployment risk is a strong predictor for positive attitudes towards welfare policies. Furthermore, he argues that social protection would develop in countries where unemployment risk heterogeneity is the smallest, because a political consensus will be easier to form on this point. Kim (2007) makes the formalised argument that the demand for unemployment insurance at the micro level depends on the combination of risk heterogeneity and wage inequality. Both authors test their argument on comparative data on unemployment risk by occupation. It is worth noticing however that the absolute level of unemployment is out of Kim's perspective and that Rehm (2011) finds the absolute level of unemployment insignificant in explaining unemployment insurance level.

Our paper is very much in line with these latter works: it is also about determining the political determinants of the demand for unemployment insurance, and to test it using cross-country variations. The original contributions of this paper are twofold. First, we provide a formal model of UI where benefits might decline with the duration of the unemployment spell.[14] Focusing on the heterogeneity in unemployment risks rather than on incomes, we explore the fact that this heterogeneity is at least bi-dimensional[15] since risk of job loss and level of employability should not be perfectly correlated. Second, we provide empirical evidence that risk heterogeneity is indeed a powerful determinant of cross-country variations

[14] Wright (1986) also formalises the issue of unemployment benefits that vary with the duration of the spell, but only for homogeneous risks of unemployment.
[15] Powell (2012) makes a similar point when analysing the preferences for active labour market policies.

in UI arrangements; more importantly, we show that risk heterogeneity not only shapes the size, but also the design of the unemployment insurance.

4. The model

In this section, we present successively two possible formalisations for UI. The first model addresses the question of the overall UI generosity. It shows that overall generosity depends primarily on two factors, namely the unemployment rate at country level and the dispersion (or heterogeneity) in unemployment risks. The second model introduces a compensation mechanism where benefits might decline with the duration of the unemployment spell. It also divides one's unemployment risk into her probability of job loss and her probability of remaining unemployed (employability), as the duration of the spell will only depends on the latter. It shows that the country level demand for degressivity increases with the heterogeneity in the ratio of long- to short-term individual unemployment risks in a median voter framework.

4.1. A simple model of UI with uniform compensation

There is a continuum of $N = 1$ agents in society. At any given time *t*, each agent may be either employed (state E_t, with probability $(1 - \theta_i)$) or unemployed (state C_t, with probability θ_i). An employed individual earns an income w_i (with probability density function g) and is subject to a proportional social contribution c.[16] As a large majority of UI schemes are wage-related, we consider that an unemployed individual gets a benefit $\alpha c w_i$ proportional to its potential labour market income.[17] α is a parameter representing the budget constraint and αc is the gross replacement rate, measuring the relative generosity of the UI.

[16] A payroll tax earmarked to unemployment insurance.

[17] Casammatta *et al.* (2000) discuss the incidence of the social insurance design on general welfare, opposing Bismarckian earnings-related benefits to Beveridgean flat-rate benefits. In particular they show that in a constitutional stage, a utilitarian social planner will implement a (partly) earnings-related design to ensure broader support for redistribution in the voting stage. Brockhoff *et al.* (2012) show that this might not hold if Bismarckian social insurance is organised within occupational groups; the Bismarckian system is then always dominated by the Beveridgean one when a utilitarian criterion or majority rule applies. Nevertheless, this corporatist feature is less relevant in the case of UI as most national systems provide unified unemployment benefits for all occupations, thus a Bismarckian system could still be chosen by a social planner.

We do not consider incentive effects in this model as we focus on the redistributive effects of the UI. Thus the distribution of θ in the population (given by the probability density function *f(.)*) is exogenous and is not influenced by the level of UI generosity. We further assume that the distribution of income and the distribution of risks are independent to simplify calculations and the presentation of our results. Anyway, this assumption should not substantially affect our main conclusions in a UI scheme where benefits are strictly earnings-related. Indeed, such a system achieves horizontal redistribution from individuals with low risk of income loss toward individuals with high risk of income loss, but only limited vertical redistribution from high toward low incomes (Wright, 1986). As a result, we expect preferences to predominantly depend on the individual unemployment risk, rather than on her income[18].

Equalising revenues and expenditures, the budget constraint imposes:

$$\iint (1-\theta_i) c w_i f(\theta_i) g(w_i) d\theta_i dw_i = \iint \theta_i \alpha c w_i f(\theta_i) g(w_i) d\theta_i dw_i$$

After simplification, this yields to:

$$\alpha = \frac{\bar{w} - \bar{\theta}\bar{w}}{\bar{\theta}\bar{w}} = \frac{1-\bar{\theta}}{\bar{\theta}},$$

where $\bar{w} = \int w_i g(w_i) dw_i$ is the average income and $\bar{\theta} = \int \theta_i f(\theta_i) d\theta_i$ is the average time spent in unemployment.

a) Individual preferences

Agents vote for the contribution rate *c* that simultaneously determines the overall level of UI expenditures and the replacement rate. If we ignore time discounting, each individual then maximises the following welfare function[19]:

$$V = (1-\theta_i)\,\mathrm{u}\big((1-c)w_i\big) + \theta_i\,\mathrm{u}(\alpha c w_i)$$

First- and second-order conditions are:

[18] In addition, taking into account a negative correlation between unemployment risk and income would relax the budget constraint, as employed individuals would have above-average income and pay more taxes while unemployed would have below-average income and receive fewer benefits.

[19] The absence of time discounting implies that our agents are maximising their lifetime utility regardless of their present state (employed or not). Including time discount does not substantially modify our results.

$$-(1-\theta_i)\,\mathrm{u}'\big((1-c)w_i\big)\,w_i + \theta_i\,\mathrm{u}'(\alpha c w_i)\alpha w_i = 0$$

$$(1-\theta_i)\,\mathrm{u}''\big((1-c)w_i\big)\,w_i^2 + \theta_i\,\mathrm{u}''(\alpha c w_i)(\alpha w_i)^2 < 0$$

This last condition is always satisfied when u is increasing and strictly concave. In the following, we specify $\mathrm{u}(x) = \ln(x)$. Such a utility function corresponds to a constant relative risk aversion (RRA) equal to 1[20]. This implies that preferences are single-peaked and a majority voting equilibrium always exists in a median voter framework (Downs, 1957). First-order condition then gives:

$$c_i^* = \theta_i$$

Thus individuals with higher risk of unemployment want to increase the contribution rate. They also want greater generosity, as measured by the replacement rate. The desired (gross) replacement rate[21] is given by:

$$\alpha c_i^* = \theta_i \frac{1-\bar{\theta}}{\bar{\theta}}$$

For a given distribution of unemployment risk, individuals with a higher risk of unemployment want a higher replacement rate. At the same time one's preferred degree of UI generosity depends negatively on the average risk of unemployment (the second multiplicative term in the replacement rate equation decreases with $\bar{\theta}$). This is a mechanical implication of the budget constraint; on the one hand, UI budget has to be shared among a higher number of beneficiaries when average unemployment rises; on the other hand, there are less people in employment so the fiscal basis is also smaller.

[20] For the sake of simplicity, we do not consider utility functions with constant RRA superior to 1, while this restriction does not alter our main conclusions. Besides, whereas such functions are often mobilised in the literature (Moene and Wallerstein, 2001; Casamatta *et al.*, 2000), they are less realistic in the case of social insurance when vertical distribution across incomes is involved (which is not the case in our model). For a given risk of income loss, they imply that richer individuals may demand more welfare expenditures (because the insurance motive dominates the redistribution motive); Iversen and Soskice (2001) present empirical evidence that contradicts this point.

[21] For presentation purposes, we analyse the effects of risk distribution on the gross replacement rate in this section, while we use net replacement rates in our empirics. This is unproblematic; the same conclusions apply to the preferred net rate (given by $\frac{\theta_i}{1-\theta_i}\frac{1-\bar{\theta}}{\bar{\theta}}$), as it similarly increases with the individual unemployment risk.

b) Political resolution

We now turn to the political resolution of this model in a majority voting framework. From above we know the agent with median preferences to be the decisive voter. Because the replacement rate is increasing with the individual risk θ_i, the decisive voter is also the agent with the median risk of unemployment. In the following we will assume that the distribution of unemployment risk is skewed to the right and therefore that the median risk is below average ($\theta_{med} < \bar{\theta}$). This assumption denotes the fact that the risk of unemployment is overly concentrated on some workers[22].

Proposition 1

- *A proportional increase in the unemployment risk of all agents leads to a decrease in the level of UI generosity.*

Proof: let us suppose that all risks are multiplied by a constant $k > 1$. The preferred replacement rate of the median then becomes:

$$\alpha c_{med}^{*} = k\theta_{med}\frac{1-k\bar{\theta}}{k\bar{\theta}} = \theta_{med}\frac{1-k\bar{\theta}}{\bar{\theta}} < \theta_{med}\frac{1-\bar{\theta}}{\bar{\theta}}$$

This result indicates that the rise in the collective cost of unemployment outweighs the rise in revenues induced by the higher contribution rate asked by the median voter, so that the previous level of UI generosity can no longer be guaranteed. Note that all agents demand a lower replacement rate after a proportional shock on the unemployment risk distribution: budget constraint issues tend to dominate the desire to insure against income loss.

Proposition 2

- *Under majority rule, a mean preserving spread (MPS) of the unemployment risk distribution implies a fall in the chosen replacement rate.*

[22] This assumption shares similarities with Meltzer and Richard (1981), who exploit the right-skewed distribution of incomes. Brockhoff *et al.* (2012) present some empirical evidence about the fact that median unemployment duration is below-average in most OECD countries. We also find the median occupational risk to be below-average for most of the countries we use in our empirical analysis. Anyway, this assumption still makes sense for a distribution of risks (slightly) left-skewed. There is indeed a much lower turnout rate among low income citizens (Anderson, 2008), a similar assumption is plausible for workers with high unemployment risk; hence the median voter should still have a below-average risk in this case. In the same line of reasoning, we can also expect political actors (unions for instance) to have preferences biased toward workers in stable employment.

Proof: the preferred replacement rate of the decisive voter can be rewritten as follows:

$$\alpha c^*_{med} = r_\theta(1 - \bar{\theta})$$

where $r_\theta = \frac{\theta_{med}}{\bar{\theta}}$ is a ratio depicting the relative distance between the median and the average unemployment risk. This ratio declines with a MPS, thus the median decisive voter will choose a smaller replacement rate as risk inequality increases.

4.2. Multidimensional unemployment risk and UI degressivity

a) Introducing differentiated benefits for long-term unemployed

We now incorporate the fact that unemployment benefits may differ after the first period of the unemployment spell. We therefore need to take the duration of the unemployment spell into account. Agents' lifetime risk of unemployment can be newly expressed as:

$$\theta_i = h(\varphi_i, \gamma_i),$$

where φ_i represents the probability of losing one's job and γ_i the probability of remaining unemployed[23]. Figure 1.4 displays a probability tree that summarises labour market transitions of our model. We can compute the probability for worker *i* of being in each state, now distinguishing between short-term unemployment C^{CT} (first period) and long-term unemployment C^{LT} (more than one period).

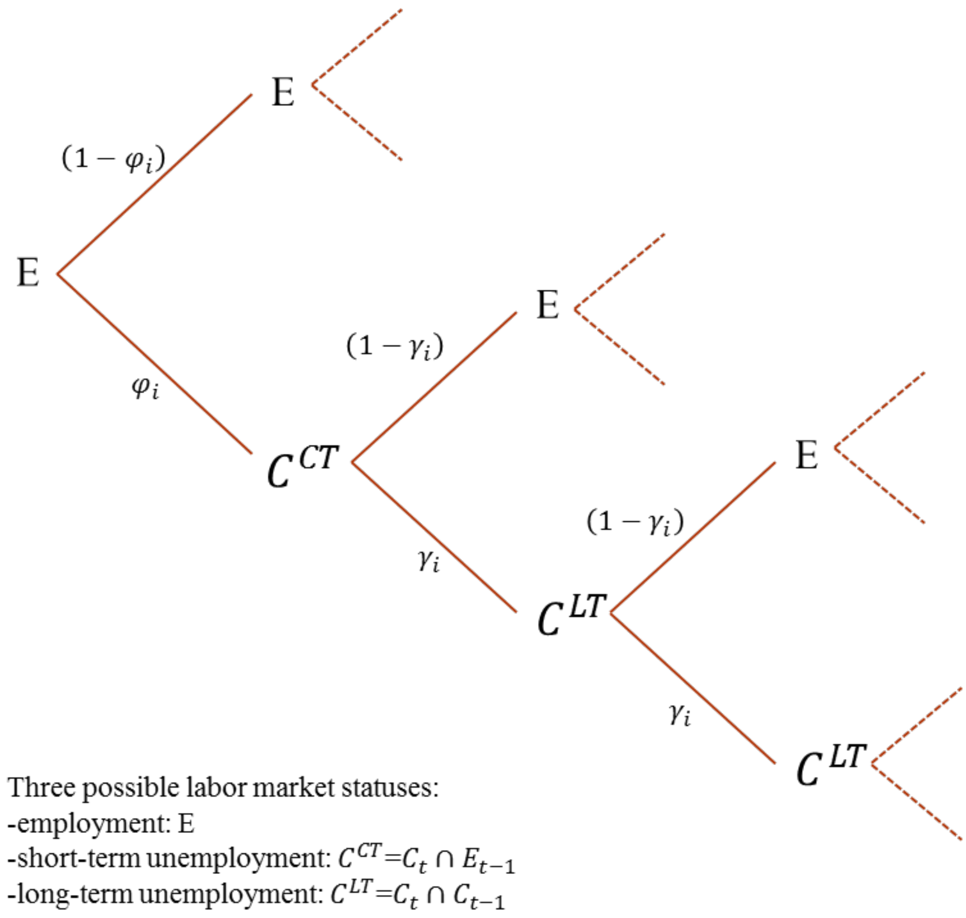
$$P_i(E_t) = (1 - \varphi_i)P_i(E_{t-1}) + (1 - \gamma_i)(P_i(C^{CT}_{t-1}) + P_i(C^{LT}_{t-1}))$$

$$P_i(C^{CT}_t) = \varphi_i P_i(E_{t-1})$$

$$P_i(C^{LT}_t) = \gamma_i(P_i(C^{CT}_{t-1}) + P_i(C^{LT}_{t-1}))$$

[23] $(1 - \varphi_i)$ then represents the individual's employment stability, while $(1 - \gamma_i)$ represents her employability. Alternatively, one can think of φ_i as a measure of the frequency of unemployment spells, while γ_i measures the duration of these spells.

Figure 1.4: Probability tree of labour market transitions



At steady state the unemployment rate for a given class of risk $(\varphi_{i,}\gamma_i)$ is constant across periods. From this we can infer the instant share of short- and long-term unemployed for a given class of risk (or equivalently the proportion of time spent in each state over the lifetime of an agent):

$$1-\theta_i \equiv P_i(E) = \frac{(1-\gamma_i)}{(1-\gamma_i)+\varphi_i}$$

$$\theta_i^{CT} \equiv P_i(C^{CT}) = \frac{\varphi_i(1-\gamma_i)}{(1-\gamma_i)+\varphi_i}$$

$$\theta_i^{LT} \equiv P_i(C^{LT}) = \frac{\varphi_i\gamma_i}{(1-\gamma_i)+\varphi_i},$$

with θ_i^{CT} (respectively θ_i^{LT}) having a probability density function noted f^{CT} (respectively f^{LT}).

Each employed individual still pays social contribution cw_i to finance unemployment benefits and receives $\alpha c w_i$ during her first period of unemployment. However this replacement rate is now discounted by a factor β for all subsequent periods of her unemployment spell. Hence, β measures the equality of treatment between short- and long-term unemployed: the greater the β, the smaller the degressivity of the system. The new budget constraint imposes:

$$\iint (1-\theta_i) c w_i f(\theta_i) g(w_i) d\theta_i dw_i = \iint \theta_i^{CT} \alpha c w_i f^{CT}\left(\theta_i^{CT}\right) g(w_i) d\theta_i^{CT} dw_i$$
$$+ \iint \theta_i^{LT} \alpha \beta c w_i f^{LT}(\theta_i^{LT}) g(w_i) d\theta_i^{LT} dw_i$$

After simplification, we get:

$$\alpha = \frac{1-\bar{\theta}}{\overline{\theta^{CT}} + \beta \overline{\theta^{LT}}},$$

where $\overline{\theta^{CT}} = \int \theta_i^{CT} f\left(\theta_i^{CT}\right) d\theta_i^{CT}$ and $\overline{\theta^{LT}} = \int \theta_i^{LT} f(\theta_i^{LT}) d\theta_i^{LT}$. Note that α depends negatively on β, suggesting a trade-off between the respective generosity of short- and long-term unemployment benefits.

b) Individual preferences

Each individual now has the following objective function:

$$V = (1-\theta_i)\ln\left((1-c)w_i\right) + \theta_i^{CT}\ln(\alpha c w_i) + \theta_i^{LT}\ln(\beta \alpha c w_i)$$

In this model, individuals vote simultaneously for the contribution rate *c* that determines the UI budget and for the degressivity factor β that determines the balance between short- and long-term benefits. Maximising the welfare function of an agent *i* with respect to the contribution rate gives us[24]:

$$c_i^* = \theta_i = \frac{\varphi_i}{(1-\gamma_i)+\varphi_i}$$

Thus, the preferred contribution rate depends solely on the individual unemployment risk θ_i and does not depend on the discount factor β. As a result, it entirely determines the overall budget for UI, regardless of the allocation between short- and long-term benefits. Moreover,

[24] See Appendix 1.2 for details on the calculation of the first- and second-order conditions.

this means that there is no strategic voting taking place, in the eventuality where we would have different decisive voter in each ballot.

Turning now to the preferences for degressivity, from first-order condition we get after simplification:

$$\beta_i^* = \frac{\theta_i^{LT}}{\theta_i^{CT}} * \frac{\overline{\theta^{CT}}}{\overline{\theta^{LT}}} = \frac{\gamma_i}{1-\gamma_i} * \frac{\overline{\theta^{CT}}}{\overline{\theta^{LT}}}$$

The preferred discount factor does not depend on c either; this parameter only determines the trade-off between short- and long-term benefits for a given UI budget. Moreover, this implies that there is no strategic voting taking place, because the outcome of one ballot does not alter the preferences for the outcome of the other ballot.

The individual risk of staying unemployed shapes the preferences for degressivity. Budget constraint issues also impact the preferred degree of degressivity, in a similar fashion as in the preferred replacement rate from the simplified model (see above). The larger the proportion of long-term unemployed compared to short-term unemployed in the society, the smaller the β and the bigger the degressivity[25].

Proposition 3

- *At the country level, heterogeneous preferences for degressivity arise from the heterogeneity in employability only.*
- *For a given distribution of unemployment risks, workers with a higher employability demand a stronger degressivity.*

Proof: the first assertion is straightforward, as preferences for long-term benefits solely depend on the probability of remaining unemployed γ_i (and not on φ_i). If all individuals have the same γ_i, then their preferences will only depend on the ratio $\frac{\overline{\theta^{CT}}}{\overline{\theta^{LT}}}$ common to all agents. This ratio might vary from one country to another, for different distribution of φ_i in the population.

[25] Note that this ratio does not solely depend on the average risk of staying unemployed after job loss, but also on how this risk is distributed among workers. In particular, countries where workers accumulate both types of risk (job loss and difficulty to find a new job) will exhibit a smaller ratio of short- to long-term unemployment than countries where these risks are spread differently among workers. See Appendix 1.3 for a formal proof of this point.

Furthermore, by differentiating we get:

$$\frac{d\beta_i^*}{d\gamma_i} = \frac{1}{(1-\gamma_i)^2} \quad * \; \frac{\overline{\theta^{CT}}}{\overline{\theta^{LT}}} > 0$$

Thus the preferred discount factor β increases with γ_i; for a given distribution of risks in the society, individuals facing high difficulties to get a new job after a dismissal are less supportive of degressivity. Note that this is not necessarily the case that these individuals have a higher absolute risk of long-term unemployment θ_i^{LT}, as this risk also positively depends on the individual job loss rate φ_i. What matters here is the risk of long-term unemployment relative to the risk of short-term unemployment.

Proposition 4

- *A decrease in the employability of any group of agents increases the demand for degressivity of all other agents.*

This result is also straightforward. It arises from the fact that a decrease of the employability of a group of agents (larger γ for this group) will negatively affect the ratio $\frac{\overline{\theta^{CT}}}{\overline{\theta^{LT}}}$ that intervenes in the demand for degressivity of all agents.

Proof: let us assume that a group of agents *j* experience a positive shift in their probability of remaining unemployed. This can be formalised by the fact that the new distribution of γ has first-order stochastic dominance over the old distribution, i.e. for $F(.)$ and $F'(.)$ the cumulative distribution functions of the old and the new distribution of γ respectively, we have:

$$F'(\gamma) \leq F(\gamma) \quad \forall\gamma$$

With a strict inequality at some values of γ.

Besides, we know by differentiation that the short-term unemployment risk of an individual decreases with her probability of remaining unemployed:

$$\frac{d\theta_j^{CT}}{d\gamma_j} = \frac{-{\varphi_j}^2}{\left((1-\gamma_j)+\varphi_j\right)^2} < 0$$

As a consequence, the shift in the probability of remaining unemployed experienced by this group of agents will also affect the distribution of θ^{CT}. Formally, the old distribution of θ^{CT} will have first-order stochastic dominance over the new distribution. Indeed, for $G(.)$ and $G'(.)$ the cumulative distribution functions of the old and the new distribution of θ^{CT} respectively, we necessarily have:

$$G'(\theta^{CT}) \geq G(\theta^{CT}) \quad \forall\theta^{CT}$$

With a strict inequality at some values of θ^{CT}. An important implication of first-order stochastic dominance is that the expected value $\overline{\theta^{CT}}$ of the new distribution will unambiguously be smaller.

Similarly, the long-term unemployment risk of an individual increases with her probability of remaining unemployed:

$$\frac{d\theta_j^{LT}}{d\gamma_j} = \frac{\varphi_j(1+\varphi_j)}{\left(\left(1-\gamma_j\right)+\varphi_j\right)^2} > 0$$

And the shift in the probability of remaining unemployed experienced by this group of agents will also affect the distribution of θ^{LT}. Applying the same line of reasoning as before, we know that the expected value $\overline{\theta^{LT}}$ will unambiguously become larger, and eventually the ratio $\frac{\overline{\theta^{CT}}}{\overline{\theta^{LT}}}$ will fall.

Recall that the preferred level of degressivity of the individual *i* is given by:

$$\beta_i^* = \frac{\gamma_i}{1-\gamma_i} * \frac{\overline{\theta^{CT}}}{\overline{\theta^{LT}}}$$

Thus, by increasing the cost of long-term compensation the shift in γ_j will lower the preferred level of β for all agents $i \neq j$ (higher degressivity). Note that the effect for the group of agents *j* is ambiguous, as the increase in their preferred β induced by the rise in their individual probability of remaining unemployed might be offset by the fall in the $\frac{\overline{\theta^{CT}}}{\overline{\theta^{LT}}}$ ratio.

c) *Political resolution*

Proposition 5

- *Under majority rule, the chosen level of degressivity increases with the heterogeneity in employability.*

Proof: the preferred level of degressivity of the decisive voter can be rewritten as follows:

$$\beta^*_{med} = \left(\frac{\theta^{LT}}{\theta^{CT}}\right)_{med} * \frac{\overline{\theta^{CT}}}{\overline{\theta^{LT}}} = \left(\frac{\gamma}{1-\gamma}\right)_{med} * \frac{\overline{\theta^{CT}}}{\overline{\theta^{LT}}} = \frac{\gamma_{med}}{1-\gamma_{med}} * \frac{\overline{\theta^{CT}}}{\overline{\theta^{LT}}}$$

Because agents differ in their preferences for degressivity according to their parameter γ_i only, preferences are single-peaked and a majority voting equilibrium exists. In a similar fashion as for replacement rate, we expect the relative distance between the median and the average ratio of long- to short-term unemployment risks to determine the chosen degree of degressivity. We have to make here two additional assumptions about the distribution of employability (alternatively the distribution of γ_i). First, we assume that the median level of employability is above average because the distribution of employability is skewed to the left by very low-employable agents. Second, we assume that differences in employability distributions are determined by how badly off these low-employable agents are. In particular, we assume that a rise in the distribution heterogeneity corresponds to a downward shift of the employability of agents that were already below the median. While this shift will lead to a fall in the $\frac{\overline{\theta^{CT}}}{\overline{\theta^{LT}}}$ ratio (see Proposition 4), the median level of employability will not be affected. Thus the level of degressivity chosen by the decisive voter will increase (smaller β).

5. Empirics

This section presents empirical evidence for some of the predictions of the model presented above, using cross-country data. We mainly test its macroeconomic implications, namely the expected relations between the distribution of risks at the country level and the UI parameters (generosity and degressivity) that are actually observed.

Regarding the overall level of unemployment benefits compensation, our model predicts that both unemployment rate and risk heterogeneity will have a negative impact on its generosity (Proposition 2). Our results are in line with these predictions. In particular, we find strong evidence that UI generosity decreases with risk heterogeneity. This result corroborates the central finding from Rehm (2011), while we use a larger sample here. Moreover, regression results indicate that the level of unemployment negatively affects the generosity, although the evidence is weaker.

Drawing on our model, we also expect degressivity to depend positively on the heterogeneity in the probability of remaining unemployed, or equivalently on the heterogeneity in employability (Proposition 5). Due to data limitations, we cannot directly test this prediction. Still, we find countries with a high share of low-employable workers (workers with skills that are specific and not easily transferable) to have more degressive UI schemes. Making the assumption that this will only marginally affect the employability of the decisive voter, it implies that those countries also exhibit larger heterogeneity in employability. Therefore, this result appears to be consistent with our model.

5.1. Empirical strategy

a) Unemployment benefits generosity

From the two-period compensation model, the replacement rate chosen by the decisive median voter is given by the following formula:

$$\left(\alpha\overline{\theta^{CT}} + \alpha\beta\overline{\theta^{LT}}\right)c^*_{med} = r_\theta(1-\bar{\theta}) \, ,$$

where αc and $\alpha\beta c$ are the replacement rates for short- and long-term compensation respectively. Hence, our model predicts that the weighted average replacement rate will decrease with unemployment risk heterogeneity, defined as the ratio $r_\theta = \frac{\theta_{med}}{\bar{\theta}}$, for a given level of unemployment. Conversely, it will decrease with the average level of unemployment for a given heterogeneity of risks.

After log-linearisation, the estimated relation becomes:

$$ReplacementRate_i = \delta_1 * Gini_i + \delta_2 * UnemploymentRate_i + \delta_3 * Controls_i + \varepsilon_i$$

where all variables are expressed in logarithm. The left-hand side term is the *overall generosity index* defined above, which is the weighted average of the net replacement rates for short- and long-term compensation[26]. In the right-hand side, a Gini index for unemployment risk is used as a proxy for risk heterogeneity, where unemployment risk is defined at the occupational level (using the 9 major groups of the ISCO classification). This measure has the advantage over other measures of heterogeneity that it is not sensitive to a general and proportional increase in the unemployment risk, while it is likely to reflect any variation in the r_θ ratio. The right-hand side also includes the average unemployment level, which represents the economic costs for the UI system induced by the share of unemployed. In line with our predictions, we expect the generosity index to negatively depend on the Gini index and the unemployment rate. We also introduce controls in some regressions to check for other possible determinants of benefits generosity.

b) Degressivity

According to our model, the level of degressivity preferred by the decisive median voter is:

$$\beta^*_{med} = \frac{\left(\frac{\theta^{LT}_{med}}{\theta^{CT}_{med}}\right)}{\left(\frac{\overline{\theta^{LT}}}{\overline{\theta^{CT}}}\right)} = \frac{\gamma_{med}}{1-\gamma_{med}} * \frac{\overline{\theta^{CT}}}{\overline{\theta^{LT}}}$$

We thus expect the relative distance between the median and the average ratio of long- to short-term unemployment risks to determine the chosen degree of degressivity. Because we assume that the median level of employability will be above average, the median ratio of long- to short-term unemployment should be above average as well, and the degressivity should increase (smaller β) with the heterogeneity in employability. Unfortunately, there is no data available about the respective share of short- and long-term unemployment at the occupational level, so that it is impossible to build a direct measure of the heterogeneity in employability. Instead, we chose to use the skill specificity index developed by Cusack *et al.* (2006). This index supposedly measures the extent to which workers can transfer their skill assets from one job to another, within the same ISCO major occupation[27]. It is thus a valid proxy for employability, as we expect individuals endowed with very specific skills to have difficulties to find a new job if they are made redundant, as there are only a few firms demanding this type of skills. Building on this index, we define two measures of heterogeneity in employability and we use them alternatively in our regressions:

[26] See Appendix 1.1 for more details.
[27] See Appendix 1.1 for the description of this index.

-the share of workers with very specific skills in the labour force. This corresponds to the share of workers in ISCO major groups 7, 8 and 9, which have the highest score for the specificity index.

-a general score of skill specificity by country. We compute this variable by weighting the share of each ISCO major group by its specificity index.

We argue that these variables not only measure the absolute level of employability in one given country but also the heterogeneity in employability, because we assume that workers with specific skills constitute the low-end tale of the employability distribution. Consequently, the bigger the share of specific skilled workers (and correlatively the higher the specific skill index of the country), the more heterogeneous the employability distribution and the distance of the median to the mean ratio of long- to short term unemployment.

This leads us to estimate the following relation (all variables are log-transformed):

$$DegressivityIndex_i = \delta_1 * SkillSpec + \delta_2 * ShorttoLongUnempRatio_i + \delta_3 * Controls_i + \varepsilon_i$$

where the dependent variable is the ratio between the long- and short-term replacement rate. This implies that countries with a low degressivity index are very degressive; conversely countries with a high degressivity index maintain the same level of compensation for long-term unemployed. We expect our degressivity index to be negatively related with our measure of heterogeneity in employability, alternatively with the share of specific skilled workers in the population and the general score of skill specificity. Because we fear that our measures of heterogeneity in employability are not accurate, we also include in some regressions the average ratio of short- to long-term unemployment $\frac{\overline{\theta^{CT}}}{\overline{\theta^{LT}}}$ that might also possibly capture part of the heterogeneity. The expectation is that countries with a high average ratio will tend to exhibit low degressivity (high degressivity index β).

5.2. Data and methodology

a) Data and main variables

Statistics for net UI replacement rates[28] in industrialised countries are made available by the OECD for every year since 2001[29]. Our generosity index is the average of short-term (first

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[28] Net means here post-tax, but excludes assistance and housing benefit provisions.
[29] Estimators are computed according to the legislation and do not take coverage into account.

year) and long-term (four subsequent years) replacement rates, weighted by the relative share of long-term and short term unemployment at the country level. Our degressivity index is the ratio between long-term and short-term replacement rates. In both cases, following OECD methodology, replacement rates are computed as the average compensation for eight different household types (varying in their income and their number of adults and children) [30]. Note that since replacement rates for long-term compensation data are only available as the average compensation for a five-year unemployment spell, our measures of generosity and degressivity might overestimate the role of very long-term compensation. Indeed, the replacement rates for the second and the fifth year of unemployment have the same weight in the index, whereas the number of people staying unemployed for five consecutive years should be marginal. Also, these data do not allow us to disentangle between scheme with a strong degressivity at the beginning of the unemployment spell and scheme with a smooth degressivity all along the five years of unemployment. However in spite of these imperfections, these data provide precious information on cross-country variations in the design of UI schemes.

For our measure of unemployment risk we use data from the ILO database, which provides information about unemployment rates for nine broad classes of occupations based on the international ISCO typology, and also gives their respective share in total employment. We use a Gini index based on the unemployment risk at the occupational level to measure risk heterogeneity[31]. The rationale behind this empirical strategy is that the occupation is one of the main determinants of an individual's employment opportunities. Contrary to other workers' characteristics (the economic sector for instance), there is indeed a low mobility between occupations, as they are based on qualifications and skills that are difficult to acquire.

As stated above, there is unfortunately no indication about the average duration of the unemployment spells per occupation, so that we cannot calculate the relative share of long-term unemployment for each occupation. Still, the OECD provides information about the relative share of long-term unemployment at the country level, which corresponds to unemployment spells longer than 12 months, which allows us to compute the average ratio of short-to long term unemployment.

[30] More details are available in Appendix 1.1.
[31] See Rehm (2011) for a similar empirical strategy.

b) Methodology

Our sample includes 155 observations on 24 OECD countries and 1 to 8 observations by country (6.5 on average). We use two different specifications in our regressions. We first run simple OLS regressions using country averages over the whole period, so that we end up with one observation per country. Average variables are computed on all available data by country. This method allows a reliable cross-country comparison and has the advantage to exclude usual time-series issues (auto-correlation, suspicion of non-stationarity). However, the small number of observations does not allow the addition of many covariates as controls. This is why we only introduce our controls one at a time.

A second specification uses the Panel-Corrected-Standard-Error methodology (PCSE): it allows us to exploit the Time-Series-Cross-Section structure of our data and to include several observations per country into the sample. The advantage is to increase the variance of dependent and explanatory variables as we also exploit within-country variation. Since the number of observations for each country varies a lot, we use weighted observations that give the same importance to each country to make sure that the results are not driven by outliers. PCSE regressions include Prais-Winsten transformation to allow for an autocorrelation of order 1 (with a common autocorrelation coefficient for all countries). However, our variables of interest are highly persistent; this is especially true for the institutional dependent variables, but also for some of our covariates, so that we observe a high degree of auto-correlation that might bias our results. Moreover, it is likely that the response to shocks in the explanatory variables will be delayed[32]. Thus, the short window of observation (8 subsequent years at most) does not allow us to add significant within-country variation that would improve the accuracy of our estimates. Consequently, we only present the estimates from the PCSE specification as a robustness check for the results obtained in OLS, and will not give them too much credit in their interpretation.

Other robustness checks include jackknife post-estimations, where observations (or countries in the case of PCSE) are dropped one at a time (results are not displayed) to exclude the possibility of outlier-driven results. We have also run an OLS estimation with another measure of degressivity provided by the OECD that details the replacement rate for the first five years of the unemployment spell; unfortunately this information is only available for the

[32] The intuition here is that it might take a couple of years for the political actors to convey the new set preferences induced by this shock.

year 2007, this is why we use the data on degressivity described above for our main regressions. Finally, we use quantile regressions to test whether the obtained results are not simply imputable to an average effect.

c) Controls

We include several controls in our regressions to check the explanatory power of our main independent variables. These controls account for various aspects of the economic and institutional context at the country level that are commonly regarded as potential determinants of social protection generosity[33]. They include the level of income inequality measured by a Gini index of the pre-tax income. Indeed, some authors (Kim, 2007) suggest that income inequality might negatively affect UI generosity, particularly in the case where unemployment is negatively correlated with income at the individual level; while we acknowledge this possibility, we argue that the relationship with unemployment heterogeneity should be stronger.

We also introduce the level of economic development, using a measure of GDP per capita. According to the so-called "Wagner law" that describes social protection as a superior good, one could expect UI to be more developed in richer countries. This would also be the case if relative risk aversion is higher than one at the micro level, as richer agents would dedicate a higher share of their income to social insurance purposes. In PCSE regressions, this control might also account for economic cycles.

Another control is a measure of trade openness, using a ratio of the share of international trade (import and export) over GDP. The intuition here is that trade openness may increase unemployment risk in sectors that are opened to international competition. While it should enhance the demand for insurance from the individuals working in these sectors, it should also increase risk heterogeneity. The global effect on UI generosity and degressivity would therefore be ambiguous.

Furthermore, we use the level of labour market regulation measured by the Employment Protection Legislation (EPL) index for standard jobs. Basically, EPL supposedly reduces job-loss risk but also job opportunities for unemployed, and there is a possible complementarity between EPL and the generosity of unemployment benefits (as suggested by Amable, 2009).

[33] All of these controls are provided by the OECD. Note that because of the lack of yearly data, we have to use the country-averaged Gini of income in PCSE specifications also.

Indeed, EPL might homogenise the risk distribution and thus foster generous unemployment benefits and low degressivity.

Finally, we also control for the level of deficit spending, as one could expect UI generosity to be low when there are no room for manoeuvre in public finances.

5.3. Results

a) Unemployment benefits generosity

Figure 1.5 displays the strong negative relationship between short-term replacement rate and occupational unemployment risk heterogeneity, where all values are country-averaged. This is a replication of Rehm (2011), reassessed here on a broader observation window and a larger set of countries.

Figure 1.1 : Short term replacement rate *and unemployment inequality*

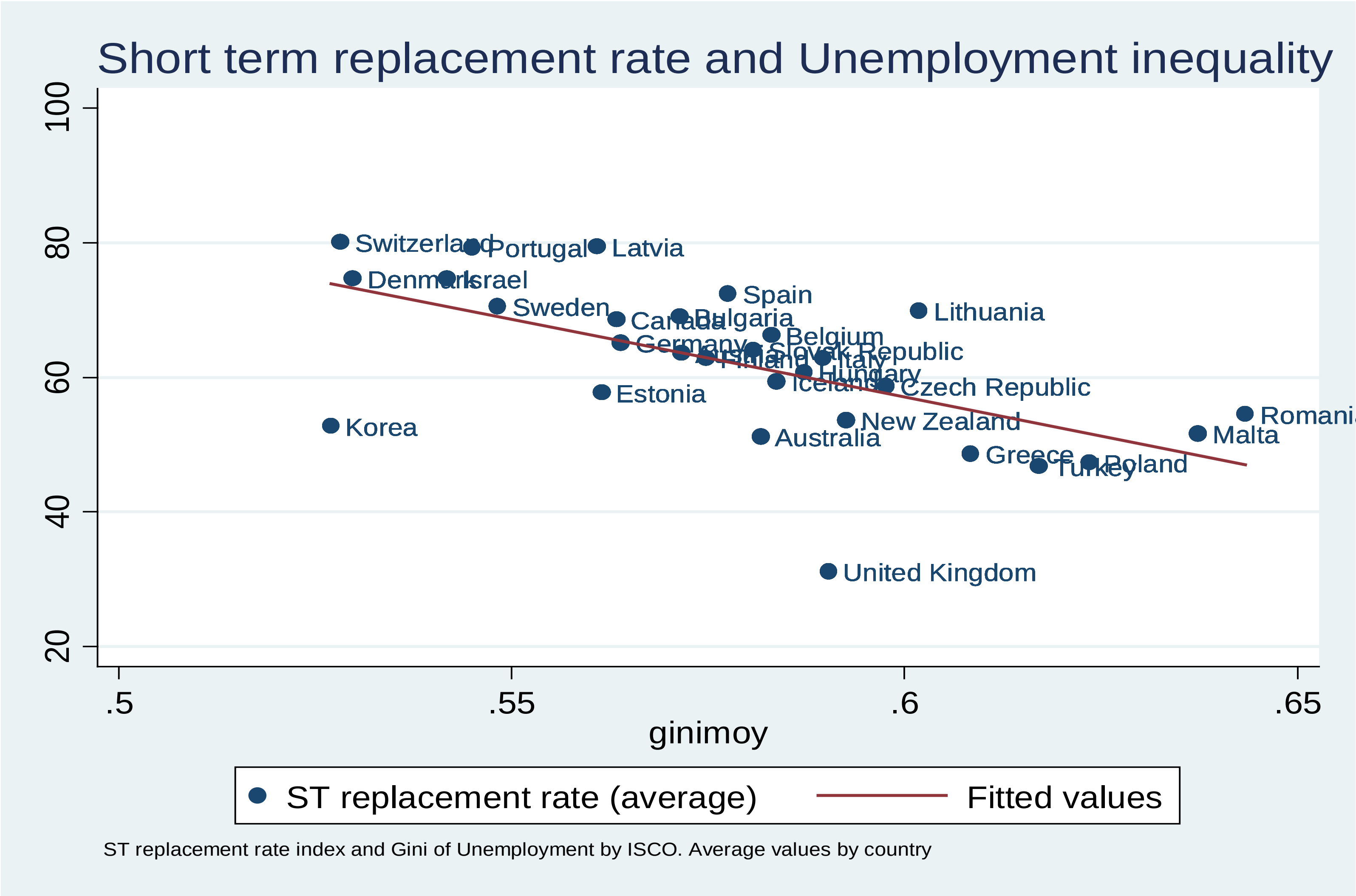


Table 1.2 : OLS Regression on average values

	(1) Short-term replacement rate	(2) average generosity index	(3) average generosity index	(4) average generosity index	(5) average generosity index	(6) average generosity index	(7) average generosity index	(8) average generosity index
Average Gini of unemployment	-262.6***	-358.3***	-294.6**	-322.8**	-254.0**	-367.4***	-381.7***	-284.8**
	(-4.37)	(-4.00)	(-2.95)	(-3.44)	(-2.98)	(-4.08)	(-4.05)	(-3.18)
Average unemployment	88.38		-109.3					
	(1.49)		(-1.34)					
Average Gini of income				-68.30				
				(-1.17)				
GDP percapita (av.)					0.000867**			
					(2.93)			
Average trade openness						-0.0678		
						(-1.01)		
Average EPL index							-0.210	
							(-0.06)	
Deficit (av.)								170.4*
								(2.17)
Constant	207.3***	254.1***	225.6***	254.4***	171.2**	265.3***	268.9***	214.1***
	(6.18)	(4.94)	(4.11)	(4.99)	(3.25)	(5.04)	(4.88)	(4.20)
Observations	29	24	24	24	24	24	22	24
R^2	0.423	0.421	0.467	0.457	0.589	0.448	0.464	0.527

t statistics in parentheses
+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

In Table 1.2, we present the results of OLS regressions, where UI generosity is our dependent variable. Except for the first column, the dependent variable is always the average of short- and long-term replacement rates, weighted by their respective share in unemployment (see above). Again, the first column replicates one of Rehm's main findings on our extended dataset: we also find risk heterogeneity to have a significant and negative impact on the short-term replacement rate, while the effect of the unemployment rate is positive but not significant. Looking at columns 2 to 8, we test the robustness of the negative impact of risk heterogeneity on our generosity index, including other potential explanatory variables one at a time. Our main specification is in column 3, which includes both unemployment level and unemployment heterogeneity. As expected, we find a negative relation between the Gini index of unemployment risk and the generosity of unemployment insurance, which is robust to the inclusion of various controls. This relation is significant in all of our specifications at the 1% level (or smaller levels). Results for the effect of the unemployment level on our generosity index are less conclusive (column 3). While its estimate has a negative sign as expected (and contrary to Rehm), it fails to achieve significance. From the included controls, we only find the GDP per capita and the public deficit to have a significant impact on the generosity index, while risk heterogeneity remains significant. The sign for public deficit is not the one expected, but one might suspect endogeneity issues to bias this estimate, as a generous UI might also impact public deficits.

Table 1.3 displays the results for regressions on our weighted generosity index, using PCSE. We notably introduce our controls altogether (column 4). These results must be interpreted cautiously; the auto-correlation of our variables is very high due to their strong persistence (especially for the dependent variable). This explains the amplitude of the R squared statistics, which are always higher than 0.88. Still, we find the Gini index of unemployment risk to be negative and significant with or without the inclusion of controls at the 0.1% level. The estimates coefficients are weaker than in simple OLS, but this is probably due to the use of a model with auto-correlation[34]. The unemployment rate eventually turns out to be significant (column 2 and 4), but as argued above no general conclusion can be drawn on this point as this effect is not robust to simple OLS.

[34] A share of the effect of the explanatory variable is captured by the auto-correlated term of error.

Table 1.3: OLS regression on Panel Data with Panel Corrected Standard Errors (PCSE)

	(1) generosity index	(2) generosity index	(3) generosity index	(4) generosity index
Gini of unemployment	-154.4***	-137.7***	-127.9***	-107.3***
	(-4.96)	(-4.89)	(-4.64)	(-4.52)
Unemployment		-64.97*		-45.63+
		(-2.31)		(-1.86)
GDP per capita			0.000548***	0.000394**
			(4.57)	(3.04)
Trade openness				-0.156***
				(-4.64)
EPL index				7.510***
				(7.48)
Deficit				15.08
				(0.83)
Gini of income (av.)				-144.3***
				(-4.45)
Constant	135.3***	130.7***	105.7***	141.2***
	(7.66)	(8.06)	(6.78)	(7.56)
Observations	155	155	155	149
R^2	0.884	0.884	0.892	0.940

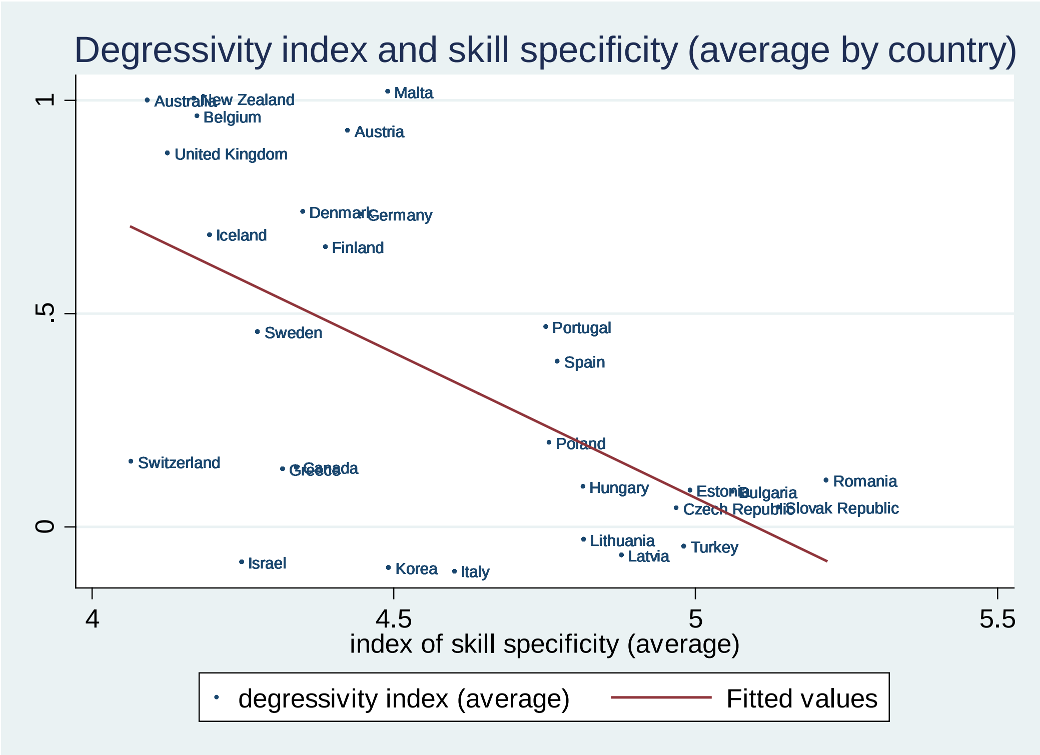
t statistics in parentheses
+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Turning to controls estimates, we only find GDP per capita to be significant in both specifications, supporting the idea that UI is a superior good. As other controls turns out to be significant in PCSE regressions only, we do not want to interpret them furthermore (except for the public deficit, the signs correspond to our expectations).

b) Degressivity

Figure 1.6 displays the relationship between the degressivity index and the general score for skill specificity defined above. As expected, the trend is negative: countries with a higher share of workers with specific skills also generally have a more degressive UI system (smaller degressivity index). While the graph reveals several outliers (Switzerland, Canada, Israel, Korea[35], Italy[36], and Greece), the relationship is not as clear cut as for Figure 1.5. It is not obvious whether this should be ascribed to the (relative) weakness of the relationship, or to the fact that we use a rather rough proxy for the heterogeneity in employability.

Figure 1.2: Degressivity index and skill specificity (average by country)



Still, we find this proxy to perform rather well in our regressions. Table 1.4 displays the results of the OLS regressions for our degressivity index. We use alternatively two proxies for the heterogeneity in employability, namely the share of workers engaged in occupations requiring specific skills (column 1) and the average score of skill specificity by country (columns 2 to 8). As expected, we find a negative relationship between the degressivity index and our main explanatory variables in all estimations: this means that a higher concentration of the labour force in specific skills occupations is associated with less degressive unemployment insurance. Estimates remain significant after the inclusion of controls, except for column 7 where GDP per capita is added as a covariate. This probably stems from the fact that the specificity score and GDP per capita are highly correlated (correlation coefficient of

[35] There is a legitimate concern about the accuracy of data for Korea, since they claim to have no more than 2% of long-term unemployed among all unemployed.

[36] Italy is a specific case: unemployment insurance is almost inexistent but redundancy payments are very high. If one considers Italian redundancy payments as a form of unemployment compensation, short-term replacement rate should be considerably higher. In turn, we would have a higher degressivity index than we do by solely focusing on the unemployment insurance.

0.81). Indeed, there is probably a bias in the measure of specificity toward countries with a large industrial sector, as occupations attached to this sector are ranked as highly specific by the index of Cusack *et al.* (2006), whereas these countries also tend to be poorer compared to post-industrial countries. Among other tested controls, the only one that appears to be (weakly) significant is the EPL index: a higher market regulation is associated with less degressive unemployment benefits, suggesting that EPL tend to homogenise unemployment duration among unemployed. Note that the average ratio of short- to long-unemployment is positive as expected, while it fails to achieve significance, suggesting that it is the heterogeneity in employability rather than its absolute level that plays a role in the determination of the degressivity index.

From the PCSE specification displayed in Table 1.5, we see that our main explanatory variables (score of skill specificity and the alternative variable) still have negative coefficients, significant at the 0.1% level, with or without the introduction of controls. In contrast to the OLS estimation, the introduction of GDP per capita as a control does not affect the coefficient and the significance of our explanatory variable (column 5). Again, we remain cautious in the interpretation of these estimates, as the autocorrelation coefficients rhos are fairly high (from 0.87 to 0.92). Among our controls, only the EPL index and the Gini index of unemployment risk are significant. Again, we do not elaborate on this latter result because of the absence of significance of this variable in the OLS regression.

Table 1.4: OLS regressions on average values

	(1) Degressivity	(2) Degressivity	(3) Degressivity	(4) Degressivity	(5) Degressivity	(6) Degressivity	(7) Degressivity	(8) Degressivity
Share of ISCO groups 7, 8, 9 in the labour force	-3.283**							
	(-3.17)							
Score of skill specificity		-0.681***	-0.658*	-0.771**	-0.636**	-1.000**	-0.359	-0.737**
		(-3.82)	(-2.70)	(-3.66)	(-3.03)	(-3.78)	(-1.00)	(-3.12)
Average short-term/long term unempl ratio			0.00645					
			(0.23)					
Gini of unemployment				1.589				
				(0.56)				
Average Gini of income					-2.250			
					(-1.43)			
Average EPL index						0.230+		
						(2.06)		
GDP per capitamoy							0.0000170	
							(1.12)	
Trade openness								0.00104
								(0.53)
Constant	1.490***	3.471***	3.353**	2.949	3.932***	4.556***	1.558	3.611**
	(4.14)	(4.25)	(2.93)	(1.71)	(3.99)	(4.28)	(0.79)	(3.60)
Observations	29	29	23	22	24	22	24	24
R^2	0.272	0.350	0.349	0.414	0.382	0.430	0.360	0.331

t statistics in parentheses
+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 1.5: OLS regression on Panel Data with Panel Corrected Standard Errors (PCSE)

	(1) Degressivity	(2) Degressivity	(3) Degressivity	(4) Degressivity	(5) Degressivity
Share of ISCO 7, 8, 9 in the labour force	-2.461*** (-5.43)				
Score of skill specificity		-0.587*** (-5.94)	-0.513*** (-4.07)	-0.548*** (-6.20)	-0.682*** (-5.30)
GDP per capita			0.000000220 (0.06)		-0.00000138 (-0.47)
Short-term/long-term unempl ratio				-0.000441 (-0.85)	-0.000330 (-0.82)
Gini of income (av.)					0.0844 (0.12)
Gini of unemployment					1.538** (2.72)
EPL index					0.104** (3.02)
Trade openness					-0.0000451 (-0.05)
Constant	1.204*** (7.18)	3.031*** (6.48)	2.695*** (4.19)	2.861*** (6.82)	2.344*** (4.44)
Observations	165	165	157	155	150
R^2	0.507	0.547	0.561	0.614	0.618

t statistics in parentheses

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

c) Robustness checks

Results are robust to jackknife re-estimation and to cross-validation (dropping country one at a time) in the case of panel regression. Appendix 1.4 displays the results of OLS quantile regressions. These quantile regressions make us confident that our main results are not an artefact due to a couple of outliers. Besides, these graphs suggest a possible non-linearity in the relation between unemployment rate and generosity, and between the skill specificity score and degressivity (while this latter result could be ascribed to the inaccuracy of our proxy of heterogeneity in employability). On the contrary, the relation between risk heterogeneity and benefit generosity appears very linear (even if some countries are clear outliers).

In order to check that the results from the PCSE estimation are not biased, given the strong persistence of the dependent variables, we use an alternative method to account for some within-country variation: we run OLS estimations where we only keep observations for year 2001 and 2007, using robust standard errors, for UI generosity and degressivity. This provides us with 39 observations (instead of 24) and supports our main conclusions. In particular, the score of skill specificity index again remains significant even after controlling for GDP per capita.

d) Summary of empirical results

Empirical evidence supports our model that puts unemployment risk homogeneity as a predominant determinant of UI generosity. Even if this result is not entirely original, it is reassessed on a large set of countries and for an index of UI generosity that takes into account long-term compensation. On the other hand, the evidence for a negative impact of the unemployment rate is less conclusive. Besides, we also find empirical evidence for a negative relationship between degressivity and measures of heterogeneity in employability.

However, we do not want to conclude on the substantive effect of our explanatory variables; the coefficients of the OLS estimates are very sensitive due to the small sample, and we suspect biases in the PCSE specification due to time-series issues (strong auto-correlation). Moreover, we also suspect possible non-linearities in the two models (generosity and degressivity). Eventually, we understand our evidence to be relevant at the cross-country level. Neither the data, nor the methodology allows us to draw any empirical conclusions at the within-country level.

6. Conclusion

In this paper, we have proposed an interest-based political economy of unemployment insurance. Underlining the distributional consequences of unemployment insurance, our main contribution was to take into account the bi-dimensional dimension of unemployment insurance (short- and long-term compensation). Our formal model provides micro-economic foundations to the determination of UI generosity: we show that the heterogeneity in unemployment risk and the level of unemployment determine this generosity. We also demonstrate that the political demand for degressivity can be ascribed to the unequal distribution of employability in the labour force. Moreover, we have presented empirical evidence in line with these theoretical results. Individual preferences based on self-interest and political mechanisms concur to shape unemployment insurance generosity, as well as the repartition of the benefits between short- and long-term unemployed.

This last point is not purely theoretical and speculative: it has important practical implications for at least two reasons. First, the employability of a worker is not a monotonic function of her risk of job loss: for instance, managers and blue-collars in the same firm may share the same risk of redundancy (if the firm goes bankrupt), but their expected unemployment duration differs due to their different level in employability. Thus, workers interests concerning unemployment insurance degressivity differ from their interests regarding the level of generosity of short-term compensation. The second reason is that for a given UI size, the choice of how benefits are shared between short- and long-term unemployed may have dramatic results on its distributional properties.

This paper provides an analytical framework to explain cross-country variations in unemployment insurance generosity and design. Further research and more data would be required to complete it by studying the dynamic of UI reforms at the country level. Indeed, even if preferences for generosity and degressivity are independent at the individual level, there is a possible trade-off between both dimensions at the political level. Hence, one could imagine the possibility for a government to compensate the dissatisfaction that a reform on one dimension (say unemployment generosity) would brought to his clientele by manipulating the other dimension (degressivity). Alternatively, this could also be a mean to reach support from a new segment of the electorate. This mechanism would be particularly relevant in a context where exogenous constraints (firm opposition, labour cost in a globalised context, etc.) prevent from raising unemployment contributions, although a concomitant rise in unemployment threatens the fiscal balance of the unemployment insurance. In such a context, degressivity can be seen as a tool used by governments to minimise their electoral losses, by targeting the cuts on marginal constituencies.

Eventually, this work has more general implications for political economy of social insurance. Indeed, economics of social protection have shown for long that "technical" parameters of social insurance may have important distributional effects (see for instance the complex calculation of pension's benefits). Our work stresses that these parameters should also be considered as important features of the electoral “game”, as they shape the attitudes of insured workers toward social insurance, and can be possibly exploited by politicians to resolve social conflicts about the use of scarce financial resources in times of austerity.

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Appendices

Appendix 1.1 - Data and construction of variables

- **Variables on unemployment (sources: OECD and ILO)**

***Unemployment rate*:** total unemployment rate by country, annual data, ILO database

***Unemployment rate by ISCO*:** annual data, ILO database,

$\frac{\text{Unemployment of ISCO \#}}{(\text{Employed people of ISCO \# + Unemployed of ISCO\#})}$. In some countries the unemployment rate computed by the weighted sum of unemployment rates by ISCO is underestimated because a significant number of unemployed do not declare any ISCO. We correct this ratio to ensure that the average unemployment computed through ISCO is equal to the actual statistic on total unemployment rate.

Share of long-term unemployment: proportion of people who are unemployed for more than one year on the total number of unemployed, annual data, OECD.

Long-term unemployment rate: Unemployment rate*share of long-term unemployment

***Short-term unemployment rate*:** Unemployment rate*(1-share of long-term unemployment)

***Gini index of unemployment rate by ISCO**:* This measure accounts for the unequal distribution of unemployment across occupation. It does not give information on the distribution of long- and short-term unemployment across ISCO (since we do not have the required data).

- **Variables on replacement rates (source: OECD):**

The replacement rate is the net replacement of unemployment insurance, housing benefit excluded provided by OECD. The average is computed for eight family types: single or married couple, without child and with two children, with earning equal to 67% and 100% of the average wage.

***Short-term replacement rate*:** average replacement rate during the first twelve months of unemployment.

Long-term replacement rate: it is calculated as follows:

$$LT\ replacement\ rate = \frac{[5 * Average\ replacement\ rate\ over\ 60\ months] - Average\ ST\ replacement\ rate}{4}$$

This formula allows disentangling short-term and long-term generosity by extracting the short-term component of the long-term replacement rate index. In some cases, this leads to slightly negative values for long-term replacement rates. For instance, when the actual duration of UI benefits is shorter than one year, our formula computes a negative long-term benefit replacement by overestimating the weight of short-term benefits. In that case, value 0 is given to long-term replacement rate.

Overall generosity index:

$$\text{Average ST RR} * (1 - \text{share of LT unemployment}) + \text{Average LT RR} * \text{share of LT unemployment}$$

(RR= replacement rate)

Whereas generosity index generally used only focuses on short-term replacement rate (e.g. Rehm, 2011, Scruggs, 2006) or are a not weighted average of replacement rate on five years of unemployment (OECD long-term net replacement rate), our overall generosity index includes short-term and long-term benefits, weighted by the average duration of unemployment in each country. This index fits better to the idea of benefits generosity of the model: it is a transfer from employed individuals toward unemployed, all along the unemployment spell. A bi-plot in appendix 1.5 shows that although correlated with short-term generosity index, our *overall generosity index* varies more across countries. Econometrics also shows both measures are not strictly equivalent.

Degressivity index: Using definitions of short-term replacement rate and long-term replacement rate presented above it is calculated as follows:

$$Degressivity\ index = \frac{Long\_term\ replacement\ rate}{Short\_term\ replacement\ rate}$$

This ratio takes value 1 in a non-degressive system (where UI benefits are constant over five years) and value 0 in very degressive systems (where UI benefits stop after one year of unemployment). If UI benefits duration is lower than one year, the degressivity index may be negative.

- **Other variables:**

Index of skill specificity: We build the skill specificity index of each country for each year by computing the average of the share of the workforce by ISCO, weighted by the relative specific skill index of each ISCO provided by Cusack *et al.* (2006) (see Table A1.1 below).

Share of the labour force in specific skills occupations: **S**hare of the labour force in ISCO groups 7, 8 and 9, which are the occupational groups involving the most specific skills (or the highest specific skill index, see Table A1.1 below).

Table A1.1: The Skill Specificity Index by ISCO

	Number of unit groups within ISCO classification	Share in ISCO classification	Empirical share in labor force			Absolute skill specificity	ISCO skill-level	Relative skill specificity	(Relative skill specificity) / StDv
ISCO88 1-digit			female	male	total	total			
1 "Legislators, senior officials and managers"	33.0	0.1	5.3	10.5	8.3	10.2	4.0	**2.6**	0.9
2 "Professionals"	55.0	0.1	13.6	12.2	12.7	11.1	4.0	**2.8**	1.0
3 "Technicians and associate professionals"	73.0	0.2	16.2	12.7	14.3	13.2	3.0	**4.4**	1.6
4 "Clerks"	23.0	0.1	22.2	6.9	13.4	4.4	2.0	**2.2**	0.8
5 "Service workers and shop and market sales workers"	23.0	0.1	21.4	7.6	13.4	4.4	2.0	**2.2**	0.8
6 "Skilled agricultural and fishery workers"	16.0	0.0	3.0	5.4	4.4	9.3	2.0	**4.7**	1.7
7 "Craft and related trades workers"	70.0	0.2	4.2	23.8	15.5	11.6	2.0	**5.8**	2.1
8 "Plant and machine operators and assemblers"	70.0	0.2	3.9	12.5	8.8	20.5	2.0	**10.2**	3.8
9 "Elementary occupations"	25.0	0.1	10.0	8.4	9.1	7.1	1.0	**7.1**	2.6
SUM	388.0	1.0	99.9	99.9	99.9		StDV	**2.7**	1.0

Source: Iversen and Soskice (2001) and Cusack *et al.* (2006)

Appendix 1.2 - Calculations of the first- and second-order conditions

Each agent maximises:

$$V = (1-\theta_i)\ln\big((1-c)w_i\big) + \theta_i^{CT}\ln(\alpha c w_i) + \theta_i^{LT}\ln(\alpha\beta c w_i)$$

Differentiating with respect to *c* gives:

$$\frac{-(1-\theta_i)w_i}{(1-c)w_i} + \frac{\theta_i^{CT}\alpha w_i}{\alpha c w_i} + \frac{\theta_i^{LT}\alpha\beta w_i}{\alpha\beta c w_i} = 0$$

$$\Leftrightarrow \frac{\theta_i^{CT}}{c} + \frac{\theta_i^{LT}}{c} = \frac{(1-\theta_i)}{(1-c)}$$

$$\Leftrightarrow c_i^* = \theta_i$$

(with $\theta_i^{CT} + \theta_i^{LT} = \theta_i$)

Second-order differentiation gives:

$$\frac{d^2V}{dc^2} = \frac{-(1-\theta_i)w_i^2}{((1-c)w_i)^2} - \frac{\theta_i^{CT}(\alpha w_i)^2}{(\alpha c w_i)^2} - \frac{\theta_i^{LT}(\alpha\beta w_i)^2}{(\alpha\beta c w_i)^2} < 0$$

Differentiating with respect to β gives:

$$\frac{\theta_i^{CT}\frac{d\alpha}{d\beta}c w_i}{\alpha c w_i} + \frac{\theta_i^{LT}\left(\alpha c w_i + \frac{d\alpha}{d\beta}\beta c w_i\right)}{\alpha\beta c w_i} = 0$$

$$\Leftrightarrow \frac{\theta_i^{CT}\frac{d\alpha}{d\beta}}{\alpha} + \frac{\theta_i^{LT}\frac{d\alpha}{d\beta}}{\alpha} = -\frac{\theta_i^{LT}}{\beta}$$

$$\Leftrightarrow \left(\theta_i^{CT} + \theta_i^{LT}\right)\frac{d\alpha}{d\beta}\beta = -\theta_i^{LT}\alpha$$

$$\Leftrightarrow \beta = -\frac{\frac{\theta_i^{LT}}{\theta_i}\alpha}{\frac{d\alpha}{d\beta}}$$

From:

$$\alpha = \frac{1-\bar{\theta}}{\overline{\theta^{CT}} + \beta\overline{\theta^{LT}}}$$

$$\Rightarrow \frac{d\alpha}{d\beta} = -\alpha\frac{\overline{\theta^{LT}}}{\overline{\theta^{CT}} + \beta\overline{\theta^{LT}}}$$

We get:

$$\beta = \frac{\theta_i^{LT}}{\theta_i} * \frac{\overline{\theta^{CT}} + \beta\overline{\theta^{LT}}}{\overline{\theta^{LT}}}$$

$$\Leftrightarrow \beta_i^* = \frac{\theta_i^{LT}}{\theta_i^{CT}} * \frac{\overline{\theta^{CT}}}{\overline{\theta^{LT}}} = \frac{\gamma_i}{1-\gamma_i} * \frac{\overline{\theta^{CT}}}{\overline{\theta^{LT}}}$$

Second-order differentiation gives:

$$\frac{d^2V}{d\beta^2} = \frac{\theta_i \overline{\theta^{LT}}^2}{\left(\overline{\theta^{CT}} + \beta\overline{\theta^{LT}}\right)^2} - \frac{\theta_i^{LT}}{\beta^2}$$

Introducing the preferred value of β yields:

$$\frac{\theta_i \overline{\theta^{LT}}^2}{\left(\overline{\theta^{CT}} + \frac{\theta_i^{LT}\overline{\theta^{CT}}}{\theta_i^{CT}}\right)^2} - \frac{\theta_i^{LT}}{\left(\frac{\theta_i^{LT}}{\theta_i^{CT}} * \frac{\overline{\theta^{CT}}}{\overline{\theta^{LT}}}\right)^2} = \frac{\left(\theta_i^{CT}\overline{\theta^{LT}}\right)^2}{\theta_i \overline{\theta^{CT}}^2} - \frac{\left(\theta_i^{CT}\overline{\theta^{LT}}\right)^2}{\theta_i^{LT}\overline{\theta^{CT}}^2}$$

$$= \frac{(\theta_i^{LT} - \theta_i)\left(\theta_i^{CT}\overline{\theta^{LT}}\right)^2}{\theta_i \theta_i^{LT}\overline{\theta^{CT}}^2}$$

$$= -\frac{\theta_i^{CT}\left(\theta_i^{CT}\overline{\theta^{LT}}\right)^2}{\theta_i \theta_i^{LT}\overline{\theta^{CT}}^2} < 0$$

And β_i^* is a maximum.

Appendix 1.3 - Formal proof of the relationship between risk distribution and the average short- to long-term unemployment ratio

"An increase in the probability of job loss of one agent will have a positive impact on the average ratio of short- to long-term unemployment if her employability is above a certain threshold and a negative impact if her employability is below this threshold."

Proof: let us assume an increase in the probability of job loss for agent *j* only. Differentiating her probability of short- and long-term unemployment yields:

$$\frac{d\theta_j^{CT}}{d\varphi_j} = \frac{(1-\gamma_j)^2}{\left((1-\gamma_j) + \varphi_j\right)^2} > 0$$

$$\frac{d\theta_j^{LT}}{d\varphi_j} = \frac{\gamma_j(1-\gamma_j)}{\left(\left(1-\gamma_j\right)+\varphi_j\right)^2} > 0$$

Not surprisingly both her short- and long-term unemployment risk will increase. From linearity of the expected value we know that:

$$\frac{d\overline{\theta^{CT}}}{d\varphi_j} = \frac{d(E(\theta_i^{CT}))}{d\varphi_j} = E\left(\frac{d\theta_j^{CT}}{d\varphi_j}\right) = \frac{d\theta_j^{CT}}{d\varphi_j}$$

$$\frac{d\overline{\theta^{LT}}}{d\varphi_j} = \frac{d\theta_j^{LT}}{d\varphi_j}$$

Looking at the effect on the average ratio of short- to long-term unemployment:

$$\frac{d\left(\frac{\overline{\theta^{CT}}}{\overline{\theta^{LT}}}\right)}{d\varphi_j} = \frac{\frac{d\theta_j^{CT}}{d\varphi_j}\overline{\theta^{LT}} - \frac{d\theta_j^{LT}}{d\varphi_j}\overline{\theta^{CT}}}{\left(\overline{\theta^{LT}}\right)^2},$$

which is negative for:

$$\frac{d\theta_j^{CT}}{d\varphi_j}\overline{\theta^{LT}} < \frac{d\theta_j^{LT}}{d\varphi_j}\overline{\theta^{CT}}$$

$$\Leftrightarrow \frac{\left(1-\gamma_j\right)}{\gamma_j} < \frac{\overline{\theta^{CT}}}{\overline{\theta^{LT}}},$$

$$\Leftrightarrow \gamma_j = \frac{\theta_j^{LT}}{\theta_j} > \frac{\overline{\theta^{LT}}}{\bar{\theta}}$$

and positive otherwise. This indicates that a deterioration in the job loss rate of a worker (or a group of workers) who has a higher relative share of time spent in long-term unemployment than the population will lead to decrease the average ratio of short- to long-term unemployment. Conversely, this ratio will increase if this worker tends to be relatively less affected by long-term unemployment than average (because she has a high employability).

As a consequence, for two given distributions of probability of job loss φ_i and probability of staying unemployed γ_i, the ratio $\frac{\overline{\theta^{CT}}}{\overline{\theta^{LT}}}$ will be smaller in countries where the same workers accumulate both type of risks. This result is pretty intuitive: countries where workers with low employability also have the more secure jobs will have a larger share of short-term unemployment in total unemployment, as unemployed would then principally consist of workers with high employability.

Appendix 1.4 - Robustness checks

Quantile regression of the specification of first model on average values (without controls)

Figure A1.1: Dependent variable: Generosity index

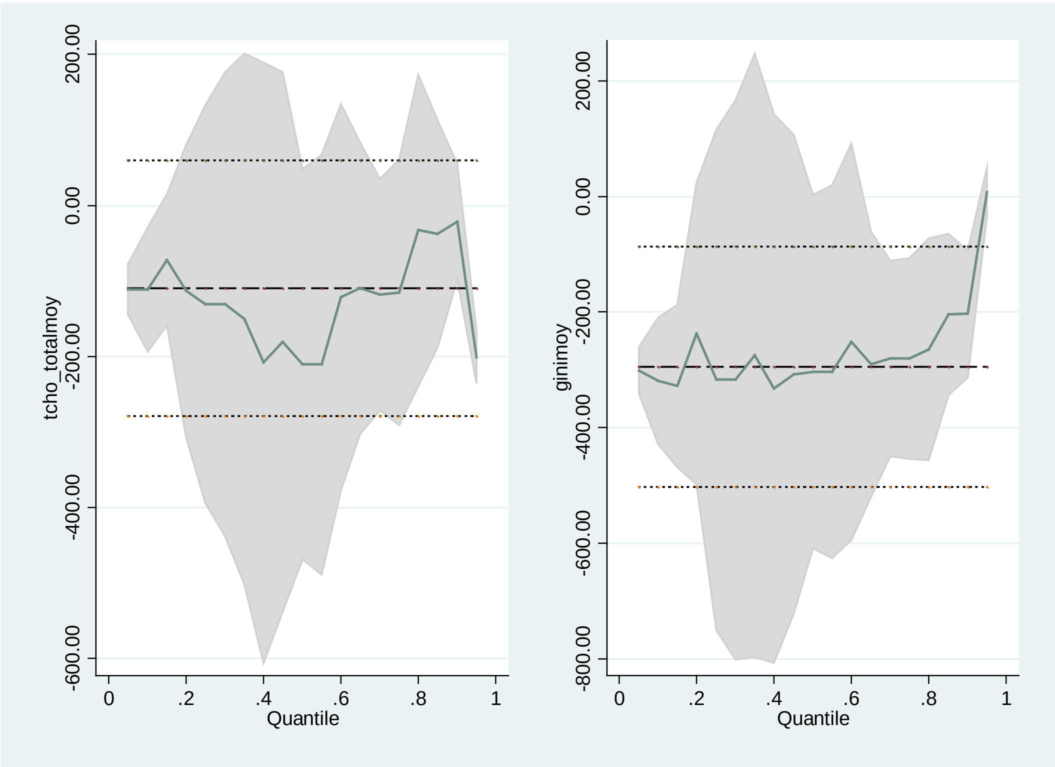

Figure A1.2 : Dependent variable: degressivity index

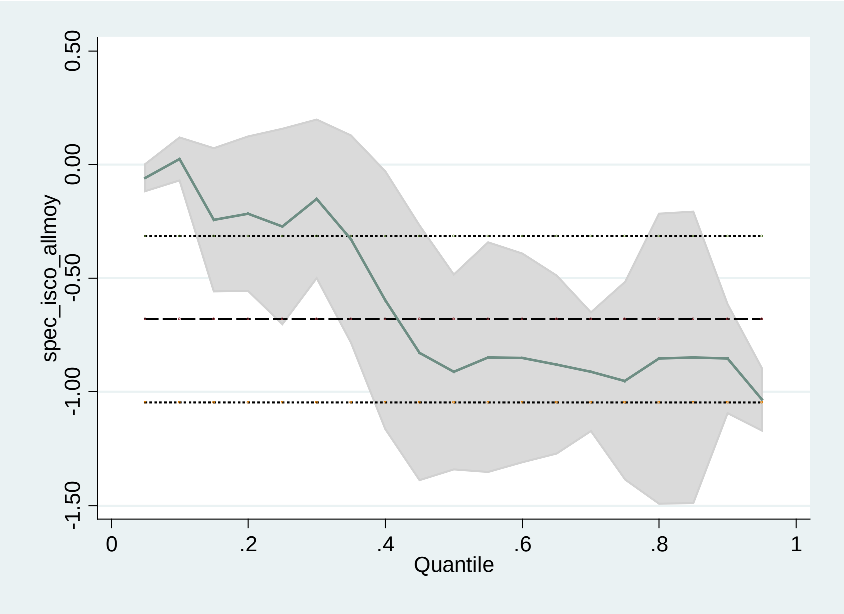

Table A1.2: Cross-validation of the PCSE estimates on generosity

	Country	erreurm~e	coef
8.	Slovak Republic	-19.13208	-197.8208
13.	Italy	-17.46943	-178.4214
18.	Czech Republic	-16.34446	-168.4258
25.	Turkey	-14.88728	-164.3811
30.	United Kingdom	-12.33514	-174.7962
40.	Greece	-10.41402	-165.6322
49.	Korea	-9.528692	-191.6648
51.	Portugal	-7.613537	-177.8758
65.	Hungary	.024832	-179.1397
72.	Poland	5.349698	-180.5727
79.	Germany	6.515472	-174.2104
88.	Australia	8.216641	-175.3734
95.	Switzerland	8.266421	-149.0591
99.	Sweden	9.623064	-170.8261
108.	Finland	9.864478	-173.3591
114.	New Zealand	10.50285	-180.9532
119.	Austria	12.86317	-178.3584
132.	Spain	13.93642	-177.0833
137.	Denmark	18.65129	-165.7181
147.	Canada	19.15788	-171.5991
149.	Belgium	25.55208	-174.6035

Note: Estimation of standard errors and coefficients of the main PCSE regression when dropping country one by one. Slovak Republic, Canada and Belgium are the main outliers but the coefficient size of our explanatory variable remains relatively stable.

Table A1.3: Replication of Table 1.3 in OLS for years 2001 and 2007 only (robust standard errors)

	(1) Generosity index	(2) Generosity index	(3) Generosity index	(4) Generosity index
Gini of unemployment	-371.4*** (-5.79)	-318.9*** (-4.21)	-301.6*** (-4.48)	-191.6+ (-1.99)
Unemployment		-106.7* (-2.28)		0.109 (0.00)
GDPpercapita			0.000709** (3.51)	0.000479+ (1.72)
Trade openness				-0.0272 (-0.31)
EPL index				2.802 (0.88)
Deficit				159.7* (2.33)
Gini of income (av.)				-71.32 (-1.14)
Constant	261.8*** (7.02)	239.1*** (5.54)	202.2*** (5.03)	162.8* (2.35)
Observations	38	38	38	36
R^2	0.310	0.365	0.445	0.584

Note: *t* statistics in parentheses. + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table A1.4: Cross-validation of the PCSE estimates on degressivity

	Country	erreurm~e	coef
7.	Korea	-1.165682	-.6061235
9.	Switzerland	-.5459871	-.7167875
15.	Greece	-.4896456	-.7967961
23.	Italy	-.4445577	-.650359
31.	Turkey	-.3196618	-.6104143
35.	Canada	-.2388615	-.6888152
43.	Sweden	-.2196661	-.8103155
50.	Czech Republic	-.1528515	-.6897804
59.	Poland	-.0789727	-.6460559
67.	Hungary	-.0705951	-.6522474
79.	Spain	.1323695	-.7157453
84.	Portugal	.226819	-.6725225
93.	Finland	.2384336	-.6954567
97.	Slovak Republic	.2903204	-1.021273
104.	Germany	.3538415	-.6588966
116.	Australia	.425117	-.693317
120.	Belgium	.4396493	-.6921055
132.	Denmark	.4885154	-.7114779
135.	Austria	.4968174	-.6955525
143.	United Kingdom	.5096036	-.6721971
150.	New Zealand	.5136828	-.5862306

Note: Estimation of standard errors and coefficients of main PCSE regression when dropping country one by one. Korea and Slovak Republic are the main outliers but the coefficient size of our explanatory variable remains relatively stable.

Table A1.5: Replication of Table 1.5 in simple OLS for years 2001 and 2007 only (robust standard errors)

	(1) Degressivity	(2) Degressivity	(3) Degressivity	(4) Degressivity	(5) Degressivity
Share of ISCO 7, 8, 9 in the labour force	-3.621***				
	(-5.21)				
Score of skill specificity		-0.839***	-0.847***	-0.833***	-1.234***
		(-6.47)	(-4.02)	(-6.52)	(-4.06)
GDP per capita			-0.00000143		-0.00000549
			(-0.14)		(-0.54)
Short-term/long term unempl ratio				-0.00364***	-0.00278*
				(-4.61)	(-2.31)
Gini of income (av.)					-0.564
					(-0.36)
Gini of unemployment					2.412
					(0.72)
EPL index					0.179+
					(1.71)
Trade openness					0.00158
					(1.03)
Constant	1.639***	4.201***	4.281***	4.214***	4.382+
	(6.36)	(6.89)	(3.62)	(6.96)	(1.80)
Observations	39	39	38	38	36
R^2	0.316	0.404	0.396	0.462	0.542

Note: *t* statistics in parentheses. + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Appendix 1.5 - Additional Descriptive Statistics

Figure A1.3: Share of LT Unemployment over Unemployment rate

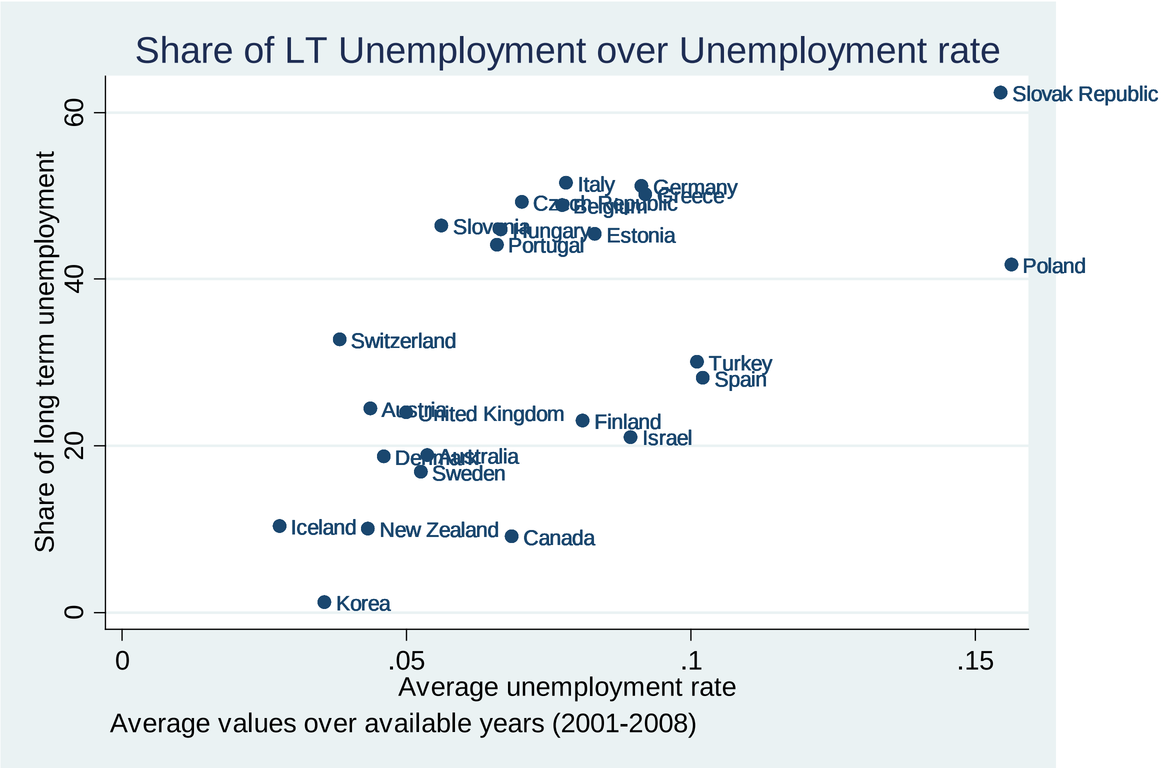

Figure A1.4: Overall Generosity index and short-term generosity

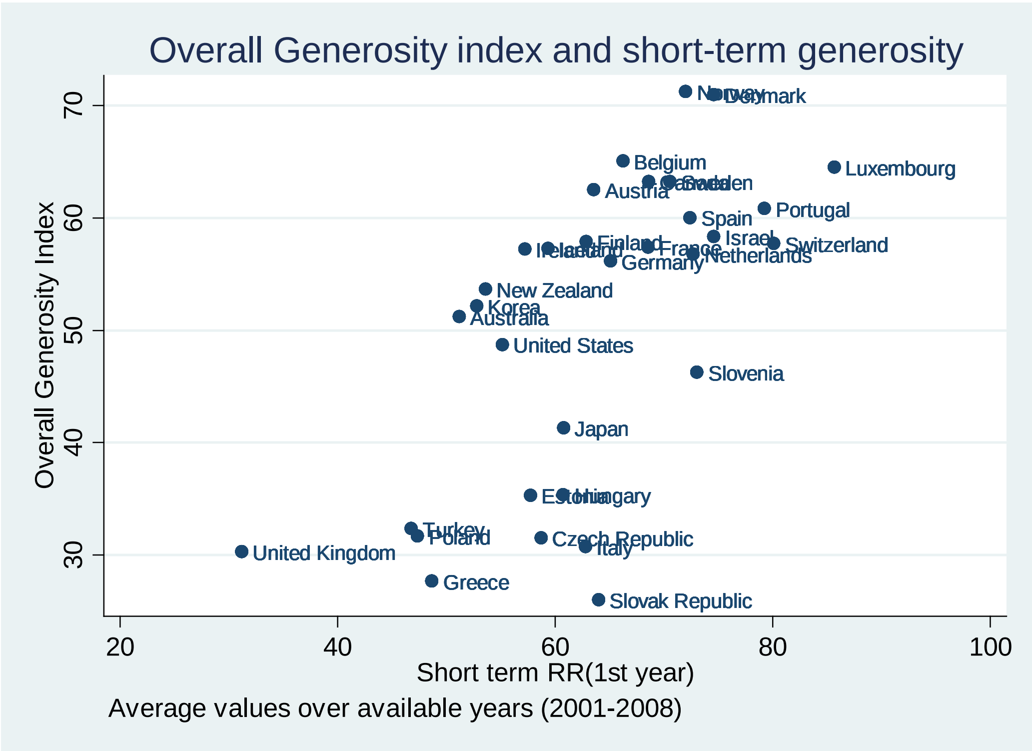

Figure A1.5: UI Generosity and unemployment inequality

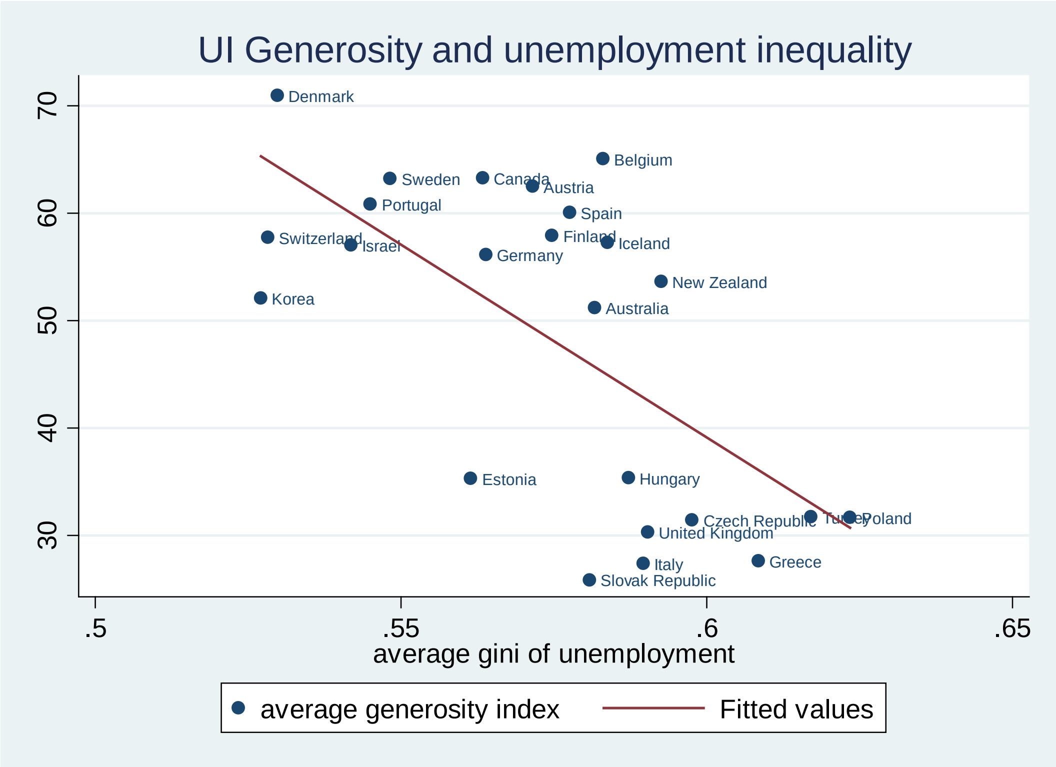

Figure A1.6: Overall Generosity index and short-term generosity

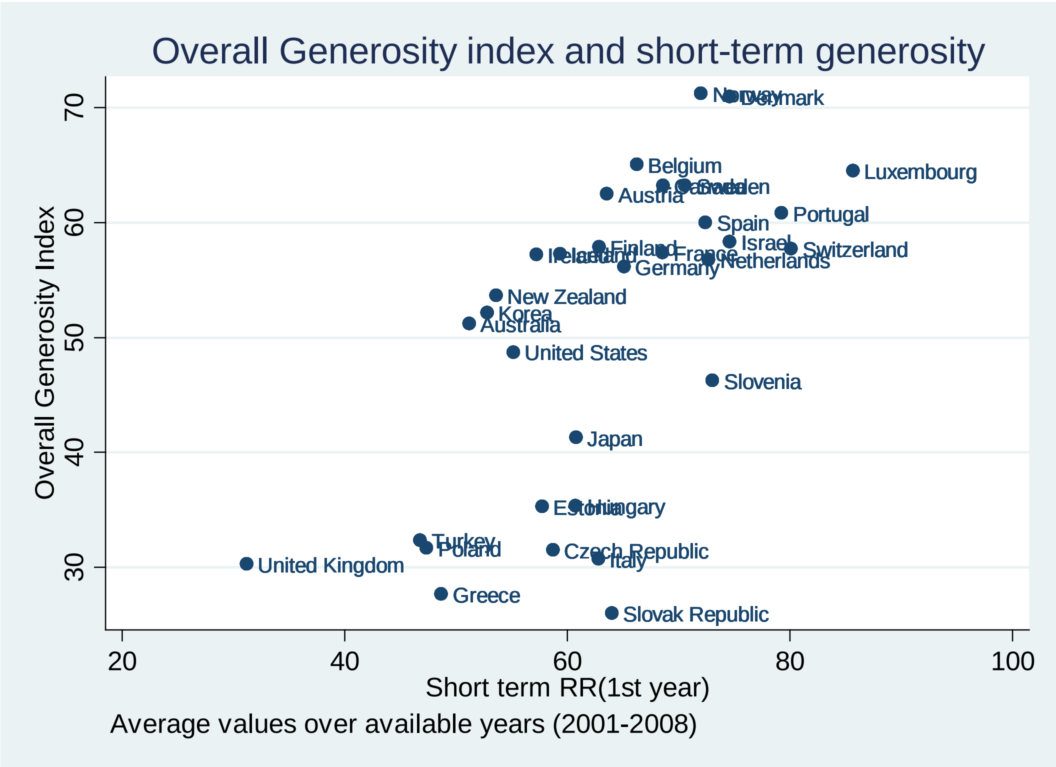

Figure A1.7: Index of skill specificity by country